I suppose it would be impossible to prove that they actually perceive colors; but to suggest that the rays of various wave-lengths produce on their eyes a different impression other than that of color, is to propose an entirely novel hypothesis.

At any rate, I think I have shown that they do distinguish between rays of different wave-lengths, and prefer those which to our eyes appear green and yellow.

The Asteroidea of H.M.S. 'Challenger' Expedition.—Part II.

By W. PERCY SLADEN, F.L.S., F.G.S.

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Family ASTROPECTINIDÆ.

Subfamily PORCELLANASTERIDÆ.

Rays five, more or less produced. Marginal plates in superior and inferior series, thin, lamelliform, apparently naked, or covered only by an extremely thin epidermal tissue. Abactinal area covered with membrane, beset with simple spiniferous spicules or pseudo-paxillæ, which occupy the whole or only a limited portion of the area. A central epiproctal prominence, more or less defined, frequently developed into an elongate tubular prolongation. Actinal interradial areas more or less extensive, paved with thin squamiform ventral plates, more or less regularly disposed and covered with delicate membrane. Adambulacral plates elongate, simple, bearing spines (one to five in number) on the furrow-margin only; or may have one or more series of small papilliform granules on the outer part of the plate. Cribriform organs along the vertical sutures of the marginal plates in the interbrachial angles. Ambulacral sucker-feet in simple pairs, with conical pointed tips. Madreporiform body placed close to the marginal plates.

Synopsis of Genera included therein.

A. Ventral plates naked. Adambulacral plates with a single series of spines on furrow-margin only. Terminal plates large, and armed with conspicuous spines. Cribriform organs 1–9 in number.

- *a.* Tubular epiproctal elongation. Dorsal membrane with simple spiniform spicules. Ventral plates not imbricated. Ambulacral furrows wide and exposed. Rays more or less turned back. Cribriform organs 1–3: component structure lamelliform. .... PORCELLANASTER.
- *b.* No tubular epiproctal prolongation. Dorsal membrane with pseudo-paxillæ. Ventral plates imbricated and arranged in columns. Ambulacral furrows narrow and concealed. Rays not revertible. Cribriform organs 5–9 (3 in one case only): component structure papilliform.
    - *α.* Rays very long. Supero-marginal plates with long, robust spines, forming a single series along the median line. Ambulacral spines long and needle-shaped, radiating apart. Marginal plates united along the median line of the ray. ...... STYRACASTER.
    - *β.* Rays short. No spines on the supero-marginal plates. Ambulacral spines short, compressed, forming independent series or fans. .... HYPHALASTER.

B. Ventral plates covered with spiniform granules. Adambulacral plates with papilliform spinelets on the outer portion of the plate. Terminal plates very small and inconspicuous, unarmed. Cribriform organs 14 in number. .... THORACASTER.

Note on the “Cribriform Organs.”—A peculiar structure, apparently associated with special functions, occurs in this group; and, in the form here described, is as yet unknown in other Starfishes. The structure in question is situated on the marginal plates in the interbrachial angle; and the number of the supposed organs, which is constant in a species, may vary from one to seven or even more in each angle. The following brief account will indicate the general character of the organ throughout the series. In *Porcellanaster* the marginal plates are of uniform thickness, and form a level plating, the successive plates fitting close together and are not separated by any vertical furrow or marginal bevelling of the plate. In a species possessing only one of these organs in each angle, the structure about to be described is located in the median interbrachial line, and consists of a number of greatly compressed spinelets or lamellæ arranged in vertical parallel lines. Each of the lines thus formed is equal in length to the height of the two series of marginal plates and is invested with membrane. Ten or more such lines or pseudo-lamellæ are present on either side of the median interbrachial suture; and these do not stand quite perpendicular to the plane of the marginal plates, but are directed at a slight angle towards the median suture. At the upper or aboral extremity, where the organ terminates on the dorsal area, there is a grouping of the spinelets that belong to the dorsal membrane, which are also rather more robust here than elsewhere on the surface. At the lower extremity of the organ, the outer lamellæ are rather shorter than the inner ones, and each being less than the next inward, a rounded outline is given to the lower or adoral extremity of the organ. Five or six flattened spinelets, directed upward and slightly inward, are placed round this semicircular margin and form an elegant fringe or comb, which closes over, as it were, upon the series of lamellæ.

On examining this organ microscopically it is found that the lines or lamellæ are made up of series of small lamellæ, placed end to end together, thus forming an apparently continuous line. Each component part or individual lamella stands upright upon its own rounded scale-like base; and the lamellar plates are made up of a single series of delicate rods united by irregular dissepiments, the whole structure being covered with a membrane, which appears to have been furnished with vibratile cilia. The scale-like plate which forms the basal portion is directly superposed upon the surface of the marginal plates, the parts occupied by the organ being slightly hollowed out for its reception. The outermost lines (pseudo-lamellæ) are composed of thicker individual lamellæ than any of the others, and these integral lamellæ stand wider apart and resemble flattened spinelets, each built up of several series of rods. On the upper portion of each line transition can be traced from the delicate lamellæ, above described, to the simple rounded cylindrical spinelets of the dorsal membrane.

Judging from the position and character of this organ, as well as from its relation to the dorsal area, it is not improbable that it functioned as a percolator; and in such a case it might perhaps be looked upon as the homologue of the minute ciliary spines which border the vertical furrows that run between the consecutive marginal plates in *Astropecten* and other forms.

As the structure is very constant and appears to form a reliable specific character, useful in determination, I propose for the sake of brevity to speak of it in the descriptions which follow under the name of the "*cribriform organ.*"

In species which have more than one of these organs in each interbrachial angle, the additional ones occur on the vertical sutures immediately succeeding on either side of the median line, and are identical with the median organ just described. No case of irregularity or intermission occurs in any of the specimens I have examined. The number of cribriform organs present in each angle appears to be always constant in a species; and species exist which possess 1, 3, 5, 7, 9, or even 14 of the organs respectively. The organ varies in the different species as regards its breadth, the number of vertical parallel lines or pseudolamellæ which compose it, and the character of the integral calcareous bodies of which these latter are formed. In *Porcellanaster* the component parts are strictly lamellar in form, as described above; whilst in the allied genera *Hyphalaster*, *Styracaster*, and *Thoracaster* the corresponding elements are papilliform.

PORCELLANASTER, *Wyville Thomson.*

Rays five, comparatively short, upturned at the extremities and frequently reverted over the dorsal area. Disk more or less inflated. Superomarginal plates not united along the median line of the ray, usually bearing a spine; and these form a series on either side of the ray. Abactinal area covered with membrane, beset wholly or in limited areas with simple spiniferous spicules. A more or less elongate tubular epiproctal prolongation * is present in the centre of the disk, which may be equal in length to the radius of the disk. Actinal interradial areas paved with thin plates, more or less regularly disposed, but not imbricating and not arranged in definite columns, covered with delicate membrane. Ambulacral furrows wide and exposed. Ambulacral spines one to three in number, elongate, tapering and sharply pointed, usually radiating apart. Cribriform organs one to three in number. Terminal plates large and robust, armed with prominent spines.

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* Prof. E. Perrier has recently published a note (Comptes Rendus, December 1882, p. 1379) on two small Starfishes obtained off the north coast of Spain, from a depth of 1960 and 2650 metres respectively. A new genus has been established for their reception, and named *Caulaster*, in reference to the dorsal peduncle with which they are furnished. Both specimens are very small, the larger of the two measuring only 5 millim. from the centre of the disk to the extremity of a ray; whilst in the smaller one the embryonic plating of the disk is still present. The few striking characters briefly mentioned by M. Perrier accord in every particular with *Porcellanaster*; and, as far as I am able to judge from the meagre information, I am constrained to regard these interesting Starfishes as young forms of some species of that genus. As to their identity with, or distinction from, the more western Atlantic species *P. cæruleus*, Wy. T.,

Synopsis of Species herein described.

A. One cribriform organ in each angle. Ambulacral spines 2–3. No segmental pits or papillæ.

† Rays short. Dorsal membrane with spinelets confined to limited areas .... *cæruleus.*

†† Rays long. Dorsal membrane entirely covered with spinelets.

* Rays tapering. Spines on each supero-marginal plate, long and delicate. Terminal plate small, with 5 spines. Spinelets of disk clavate .... *caulifer.*

** Rays broad and robust. Spines on two plates only, stout. Terminal plate large and tubercular, with 3 spines. Spinelets of disk cylindrical .... *tuberosus.*

B. Three cribriform organs in each angle. One ambulacral spine. Segmental pits and papillæ.

† Rays long and robust. Dorsal membrane entirely covered with spinelets. Spines on each supero-marginal plate, long and thick .... *crassus.*

†† Rays short and delicate. Dorsal membrane with spinelets confined to limited areas. No spines on the supero-marginal plates or only rudimentary .... *gracilis.*

PORCELLANASTER CÆRULEUS, *Wyville Thomson.*

Porcellanaster ceruleus, *Wyville Thomson* (1877), *Voy. of 'Challenger,' Atlantic*, vol. i. p. 378, figs. 97 & 98.

Marginal contour substellate, with five moderately developed

I am not in a position to express an opinion. The smallest examples of that form with which I am acquainted are larger than those named *Caulaster pedunculatus* by M. Perrier.

In referring to the alliance of his type with *Ctenodiscus*, my friend and colleague states that the marginal plates of the young specimens under discussion form only a single row. I venture to think that on closer examination a double row (*i. e.* supero-marginal and infero-marginal series) will be found to exist, as is distinctly the case in *Ctenodiscus*.

The interesting form recently described by Danielssen and Koren under the name of *Ilyaster mirabilis* (Nyt Mag. f. Naturvidensk. 1883, bd. xxviii. 1, p. 4) is unquestionably more nearly allied to the genus *Astropecten* than any of the forms under notice.

rays proceeding from a truly pentagonal body-disk, the lesser radius being in the proportion of 48–50 per cent.; $R=22$ millim., $r=10{\cdot}5$ millim. (the largest example). When viewed from above, the rays seem comparatively small and have the appearance of springing somewhat rapidly from the angles of the disk, the interbrachial angle being very wide and not unfrequently quite straight or even curved outward, rather than rounded. Disk more or less gibbous and inflated, the height being sometimes equal to one third of the greatest diameter, but generally less. The arching or inflation of the dorsal surface extends along the ray and tapers off with a graceful curve towards the extremity, which causes the rays to have a very short appearance when seen in profile.

Dorsal area covered with a thick coriaceous integument, the usual meshwork skeleton of calcareous plates being altogether wanting. The membrane is indurated with a number of minute circular spicules, some of which bear a vertical spinelet, resembling the surface-spicules of *Thyonidium* and other Holothuroids. These spinelets are sparsely distributed over the central portion of the dorsal area and along bands that run therefrom to the arm-angle, in the median interradial line. The spinelets are long and thin, and being made up of fine calcareous rods united by short transverse dissepiments present, under the microscope, a very open structure somewhat resembling the delicate hair-like spines of certain irregular echinoids. The spinelets are clothed with thick investing membrane, which not unfrequently develops a knob at the extremity, and gives a club-shaped character to the appendage. A more or less prominent tubular epiproctal prolongation is present in the centre of the disk; in some examples measuring between two and three millim. in length, but shorter in others. It is a subcylindrical tube less than a millimetre in diameter, springing directly from the dorsal area, tapering very slightly towards the extremity, and is indurated with a close plating of very minute spinulate spicules.

Marginal plates form a deep conspicuous band, and stand as a perpendicular wall in the interbrachial angle, bending gently inward above and below. Along the rays the supero-marginal series arch well over on the dorsal surface, and leave only a very constricted space along the median line of the ray between the corresponding plates of either side. The superior series are 6 or 7 in number exclusive of the terminal, are bounded by straight lines, and vary from a quadrate to a subrhombic form according to position. The height and length are nearly equal, the latter being usually the greatest, although in some specimens the proportions may be reversed. Normally each of the supero-marginal plates bears a short conical spinelet on its upper edge; but not unfrequently these become aborted into little more than tubercles and are sometimes absent altogether, especially in those plates which are innermost in the arm-angle, and sometimes also on the penultimate plate of the ray. The terminal plate is moderately large and prominent, with the dorsal surface slightly tubercular, the adoral margin deeply indented in the median line, and the lateral angles fully rounded. The whole plate is directed at a slight angle upward in relation to the ray, a circumstance which emphasizes the strongly upturned appearance presented by the rays, the general habit of which seems always to be more or less bent upward or backward. Three moderately robust spinelets are borne on the terminal plate—one placed at the summit of the tubercular swelling in the median line of the ray and directed vertically upwards; and two somewhat smaller ones, which stand one on either side at the extreme anterior lower angles of the plate and directed outward. The infero-marginal plates usually correspond both in number and in length with the companion superior series; but sometimes a little irregularity occurs at the extremity of the ray, and an additional plate may be present. The infero-marginal plates are not so high as the superior series, and are longer than high, excepting perhaps one or two of the innermost plates of the angle. The ventral edge of the plates is curved outward, which gives a festooned appearance to the lower margin of the series; and after the first two plates in the arm-angle the succeeding ones have their proximal end higher than the distal end, so that the series tapers off gradually towards the extremity of the ray. Cribriform organs, one in each interbrachial angle, rather broad and well defined; structure lamelliform (*cf.* description above).

Ambulacral furrows wide, open, straight, tapering from the mouth to the extremity, occupying nearly the whole of the under surface of the ray. Adambulacral plates rather short and broad, with the adoral and aboral extremities somewhat incurved, leaving a small cavity between adjacent plates, which is filled in with membrane. Each plate bears two short, sharply-pointed, conical ambulacral spinelets, the adoral one being longest. The spinelets are placed slightly oblique, and are covered with an investing membrane which unites them together at the base and joins them up to the neighbouring pairs, concealing to a certain extent their actual size and shape.

Mouth-plates moderately large and prominent, sharply upturned along the line of junction, forming a swollen, semitubercular keel considerably elevated above the general surface of the ventral area. A single mouth-spine is borne at the mouth-angle, placed on the line of suture and directed inwards; and two smaller, compressed, subtriangular mouth-spines stand on the margin of each mouth-plate near their aboral extremity. No secondary mouth-spines are present on the surface of the mouth-plates.

The peristome is wide, occupying fully two fifths of the ventral area of the disk; and the mouth is situated in the centre of a naked leathery membrane and furnished with a well-developed muscular lip.

The interbrachial areas form a fairly regular equilateral triangle—the distance from the innermost point of the mouth-angle to the place where the area terminates and the marginal plates join up immediately to the adambulacral plates being about halfway out on the ray, and approximately equal to the base of the area that extends along the arm-angle. The area is covered with a compact pavement of calcareous plates, subhexagonal or subquadrate in form, arranged in columns parallel with the median interradial line. The whole is covered with a thick membrane, through which the plates are scarcely perceptible until the specimen is dried.

The madreporite is large and conspicuous, subcircular or oval in form, and situated in an interradium close up to the dorsomarginal plates, and consequently adjacent to the cribriform organ. Sometimes it is subtriangular in contour, with the base directed to the margin, and the striæ form lines sharply bent at an angle, running more or less parallel with the sides of the triangle, the open angle being directed towards the base.

Colour, in alcohol, yellowish white, with a bluish-grey shade over the disk. The marginal plates and the actinal interbrachial areas have a peculiar glazed appearance, consequent on the character of the investing membrane.

Station 45. Lat. 38° 34′ N., long. 72° 10′ W. Depth 1240 fms.; bottom temperature 2°·4 C.; mud.

Station 46. Lat. 40° 17′ N., long. 66° 48′ W. Depth 1350 fms.; bottom temperature 2°·3 C.; mud.

Station 47. Lat. 41° 15′ N., long. 65° 45′ W. Depth 1340 fms.; mud.

PORCELLANASTER CAULIFER, n. sp.

Rays five, moderately long and slender, not much broader at the base than at midarm, tapering only slightly. Interbrachial angles rather flatly rounded; the lesser radius in the proportion of 30 per cent.; $R=21$ millim., $r=6{\cdot}5$ millim. Disk high, gibbous, and much inflated. Dorsal area covered with an integument, beset with spinelets, excepting at the very base of the rays. The spinelets are simple, delicate, clavate or thickened at the extremity, covered with membrane, and rather widely spaced. Large papulæ-like bodies are interspersed here and there. Tubular epiproctal prolongation very long, nearly equal to the lesser radius, rather narrow and tapering towards the extremity.

Marginal plates moderately high, forming a perpendicular wall in the interbrachial angle, but arching over on the dorsal surface of the rays, and leave only a narrow space along the median line between the corresponding plates of either side. The supero-marginal series are seven in number, exclusive of the terminal; all are longer than high, and each carries a long, delicate, acicular spinelet. The terminal plate is large and elongate, very slightly prominent dorsally, and flattened; and normally carries three spinelets, though sometimes more are present. These are longer than the spinelets on the other supero-marginal plates and are delicate and acicular; one is placed above the termination of the ambulacral furrow, and one on either side a little beneath. Occasionally one or both of these lateral spines may be reduplified, thus producing the additional number. The infero-marginal plates correspond in number and length with the superior series, and are, like them, longer than high; they do not curve round on the actinal surface of the ray, which is flat. Cribriform organs, one in each angle, very broad, well defined, and with a deep depression down the median line; structure lamelliform.

Ambulacral furrows broad, open, and straight. Adambulacral plates small, rather elongate in the direction of the ray and rather widely separate. The margin towards the furrow is incurved, and the adoral extremity is somewhat scooped out and has the margin slightly lipped, the aboral extremity of the next plate being rounded, thickened, protruded, and lipped in correspondence; but the two do not join up closely, and a narrow vacant space is left between. Ambulacral spines two, minute, delicate, acicular and sharply tapering, the adoral one longest and placed at the extreme adoral end of the margin of the plate, and the companion spine situated at the commencement of the curve along the furrow-margin; the long spine is consequently directed almost transversely across the furrow, whilst the small spine stands at an angle of about 45° to it.

Mouth-plates rather broad and suboval, elevated into a moderately high and well-rounded keel, a small elliptical space being left between the two adjoining plates near the middle of the median line. The aboral extremity of the plates is gracefully rounded, and the margins of the plates do not meet along the lower portion, but leave a triangular outline of the odontophore visible. Mouth-spines: one short conical spinelet at the adoral peak of the mouth-angle, standing at the junction of the two plates; and two small spinelets, similar to this, on the lateral margin of each plate. The aboral spinelet is placed near the middle of the margin, and the companion one, which is smaller, nearer the adoral extremity of the plate. All the mouth-spines are smaller than the ambulacral spinelets.

Interbrachial areas small, subtriangular, covered with membrane; plating irregular and small.

Colour, in alcohol, greyish white, with a darker shade of bluish grey over the disk.

Station 191. Lat. 5° 41′ S., long. 134° 4′ E. Depth 800 fms.; bottom temperature 3°·9 C.; mud.

PORCELLANASTER TUBEROSUS, n. sp.

Rays five, interbrachial angles well rounded, the minor radial proportion being 32 per cent.; $R=18{\cdot}5$ millim., $r=6$ millim. The rays spring gradually from the angle and taper moderately towards the extremity, maintaining a robust character throughout. Disk not high, and very slightly inflated. Dorsal area covered with a rather fleshy integument beset with simple spinelets somewhat closely placed; these are short, cylindrical, obtuse, covered with membrane, and occupy the whole of the surface excepting only the extreme angle at the base of the ray. A well-developed epiproctal tubular prolongation rises from the centre of the dorsal area, and is nearly equal in length to the distance between the centre and the inner edge of the marginal plates in the arm-angle; it tapers very slightly towards its extremity and is indurated with spicular spinelets like the rest of the dorsal membrane.

The marginal plates form a deep margin and curve over roundly in the interbrachial angles, the inferior as well as the superior series being visible from above. Upon the rays the superior series arch well over and almost meet in the median dorsal line, giving to the ray a more or less subcarinate character. The supero-marginal plates are four in number from the median interbrachial line to the extremity, exclusive of the large terminal plate, and all are distinctly longer than high. The second and third supero-marginal plates from the interbrachial line bear short conical upright spinelets; but all the rest are unarmed excepting the terminal plate, which carries three spines—one at the extremity in the median line of the ray, and one on either side at the anterior extremity of the inferior margin of the plate. The terminal plate is swollen and prominently tubercular dorsally, and is excavated on its outer extremity for the passage of the terminal ambulacral tube. In one ray of the specimen under notice, the penultimate supero-marginal plates are also swollen and ankylosed, in such a manner as to resemble the terminal plate, and bear a single spinelet. The infero-marginal plates are five in number, and are much shallower than the superior series and also shorter. The two series consequently do not correspond, a result probably brought about by the extreme development of the terminal plate, which occupies the space both of superior and inferior plate. Cribriform organs one in each angle, rather broad and with a deep depression down the median line; structure lamelliform.

Ambulacral furrows wide and open, occupying nearly the whole of the actinal surface of the ray. Adambulacral plates small, and form regular triangular prominences which indent, as it were, the margins of the furrow. Ambulacral spines two on each plate, short, subconical, sharply pointed or thorn-like, placed side by side on the aboral side of the projecting angle; they are consequently directed aborally and at an angle towards the furrow, diverging also slightly from one another.

Mouth-plates rather large, forming an acute angle adorally, with an elevated angular ridge along the line of suture, each plate being strongly bent downwards and having the upturned edges compressed together to form the keel. The aboral extremity is more elevated than any other part and presents a sharp angular peak, the mouth-plates sloping down therefrom with a graceful inward curve to the level of the interbrachial area. A single short conical mouth-spine is placed at the extremity of the adoral peak; and two others, about equal in size to the ambulacral spines, stand on the lateral margins of each plate, the most adoral of the two being situated nearly midway between the extremities of the margin.

The actinal interbrachial areas are small and sagittiform in outline, and do not extend beyond the third adambulacral plate. The plates are small, subregular, transversely elongate on the outer portion of the area, and with a tendency to imbricate, this character, however, being so faintly presented that it is difficult to say whether imbrication really exists or not.

Colour, in alcohol, greyish white, rather darker over the dorsal area of the disk.

Station 237. Lat. 34° 37′ N., long. 140° 32′ E. Depth 1875 fms.; bottom temperature 1°·0 C.; red clay.

PORCELLANASTER CRASSUS, n. sp.

Rays five, elongate, robust, gradually tapering from the base to the extremity. Disk small. Interbrachial angles well rounded, the lesser radius being in the proportion of 30 per cent.; $R=35$ millim., $r=10\cdot5$ millim. Disk not high and only slightly inflated above the level of the marginal plates.

Dorsal area much contracted in consequence of the inward arching of the marginal plates, these latter forming a broad border enclosing a regular pentagonal area when seen from above. The whole dorsal area, excepting a very small space at the base of the rays, is beset with simple spinelets, uniformly distributed over the surface and moderately well spaced, the spinelets being very small, short, cylindrical, and invested with membrane. In the interspaces between the spinelets, small papulæ may, with difficulty, be detected here and there; in external appearance they resemble the spinelets, but are rather larger and thicker. A broad, tapering, epiproctal tubular prolongation, about 3 millim. in length, is present in the centre of the disk.

Marginal plates high, arching inward, and forming a sloping or bevelled edge to the disk in the interbrachial angles; and with a similar inclination also continued along the rays. The dorsal surface of the rays is consequently arched, and the supero-marginal plates of the two sides almost meet in the median line, being separated only by a narrow furrow. The actinal surface of the ray is flat. The supero-marginal plates are higher than long, and each bears a large robust spinelet nearly as long as the height of the plate. The innermost spinelet on each side of the arm-angle is smaller than any of the others. There are seven supero-marginal plates from the arm-angle to the tip of the ray, exclusive of the terminal plate. This latter is large and very prominent, compressed laterally, high, tubercular and rounded dorsally, and bears four spines—one placed in the median line above the termination of the ambulacral furrow, and one on either side of the furrow at a lower level, all the three being close together at the very extremity; whilst the fourth spine is placed in the median line well back on the tubercular elevation of the terminal plate. The infero-marginal plates, which are nine in number, are longer than high and do not curve round on the actinal surface, but rise abruptly at a sharp angle to it. At the extremity of the ray there are occasionally two or three small irregular supplementary plates intercalated between the dorsal and ventral series, but which in no way interfere with the form or position of the terminal plate. Cribriform organs three in each angle, well separated, the median one broadest, each with a depression down the median line; structure lamelliform.

Ambulacral furrows wide, straight and open. Adambulacral plates elongate in the direction of the ray, their form simulating the appearance in outline of caudal vertebræ. Each bears a single short curved ambulacral spinelet articulated at the adoral extremity of the margin and usually directed transversely across the furrow, or sometimes at an angle more adorally, the curvature of the spine being downwards. Midway between the extremities of the plate is placed a small, thin, semicircular scale-like papilla, with the straight base upon which it is articulated running parallel with the furrow, and having the rounded free lip directed outward. Each of these papillæ shut down upon a small cavity or pit, the function of which is as yet unknown. The cavities are filled with very fine dark-coloured matter, which may either be mud or excreted matter. I shall speak of these structures as *segmental pits* and *papillæ*.

Mouth-plates large and prominent, the mouth-angle presenting a broad well-rounded keel. At the aboral extremity there is a graceful slope; the margins of the plates are united, and do not expose the odontophore. In the median line of the keel, however, midway between the extremities, a hollow elliptical space occurs where the margins of the plates do not meet. The adoral extremity is somewhat rounded, and a single short conical spinelet is borne at the union of the two plates, occasionally with a small secondary companion standing above it. No other mouth-spines are present on the plates. On the side of each mouth-plate two of the segmental pits and their papillæ are present: the aboral one is the larger of the two, and is placed rather nearer the aboral extremity than midway on the plate, the smaller pit and papilla being about equidistant between the adoral extremity of the mouth-plate and its larger companion. Actinal interradial areas very small and subtriangular, covered with a leathery skin through which the plating is scarcely discernible.

Colour, in alcohol, yellowish grey, with a brownish shade near the disk, darkest near the borders of the area adjoining the marginal plates.

Station 286. Lat. 33° 29 'S., long. 133° 22' W. Depth 2335 fms.; bottom temperature 0°·8 C.; red clay.

PORCELLANASTER GRACILIS, n. sp.

Rays five, rather long and slender, slightly tapering, somewhat flattened. Interbrachial angles wide, the immediate arm-angle being more or less straight. Minor radial proportion 45 per cent.; R=10 millim., r=4·5 millim. Disk moderately high and inflated. Dorsal area covered with a thin membrane. Spinelets, borne on spicule-like plates, confined to bands along the interradial lines, and a few surrounding the epiproctal tube, the radial area being entirely without spinelets. The spinelets are very minute, little more than microscopic spicules, elongate, cylindrical, not tapering, covered with a thin membrane through which the calcareous base and shaft are distinctly visible. The tubular epiproctal prolongation is moderately well developed, broad at the base and tapers rather rapidly.

Marginal plates not high, forming an almost perpendicular wall which bends inward very slightly; they do not arch over on the sides of the rays and their curvature produces only a slight rounding of the margin. The dorsal area of the ray is flat, and the space which intervenes between the marginal plates of either side is covered with membrane. This band is nearly uniform in breadth throughout, and is equal to one third of the greatest breadth of the ray; it extends up to the extremity, the adoral margin of the terminal plate being indented for its continuation. The supero-marginal plates are eight in number, counting from the median interbrachial line and exclusive of the terminal. Their shape is nearly quadrate, the most inward and the most outward plates having the height rather greater than the length, whilst those midway present the reverse proportions. The infero-marginal series correspond in number with the superior series and, excepting the innermost plate, have the length greater than the height. Each of the supero-marginal plates normally carries a minute tubercle or rudiment of an aborted spinelet; but in some instances even this is wanting. The terminal plate is not at all gibbous or tubercular, and its size and outline is conformable in every way to the regular tapering of the ray. Three small delicate spines are borne on the terminal plate—one placed at the extremity, in the median line, which points upward and outward; and one on either side, at a lower level, which are separated by the furrow, and directed horizontally and radiate slightly outward from the axial line of the ray. Cribriform organs three in each angle, the lateral ones very narrow, all well spaced; structure lamelliform.

Ambulacral furrows wide, straight or very slightly petaloid, and open. Each adambulacral plate bears a single ambulacral spinelet, also a rather large segmental pit and papilla. The ambulacral spine, which is placed at the adoral extremity of the plate, is comparatively robust, cylindrical, slightly tapering, and longer than half the breadth of the furrow, over which it is directed horizontally and slightly inwards (adorally). The segmental papilla is subcircular in shape, nearly half as large as the whole adambulacral plate, and is situated midway between the bases of adjacent ambulacral spinelets, the margin towards the furrow being straight. Towards the end of the ray the papillæ are turned back and directed slightly over the furrow, instead of being closed down upon the surface of the plate; and the pit is probably aborted.

The mouth-plates form a rather broad mouth-angle, presenting a well-developed keel along the median line of junction, more or less imperfectly closed along the suture and widely open at the aboral extremity. A single, short, conical, sharply pointed mouth-spine to each mouth-angle stands at the innermost point and in the median line. Two large segmental papillæ occupy nearly the whole of the lateral portion of each mouth-plate; they stand close together, touching one another, and the aboral one is the larger of the two.

The actinal interbrachial areas are small; and the squamous plates are comparatively few in number, these being rather large in the immediate angle, though very narrow and elongate near the margin.

Colour, in alcohol, greyish white, excepting the dorsal membrane, which is bluish grey.

Station 298. Lat. 34° 7′ S., long. 73° 56′ W. Depth 2225 fms.; bottom temperature 1°·3 C.; grey mud.

STYRACASTER, n. gen.

Rays five, long and attenuate, incapable of being reverted. Superomarginal plates meet in the median dorsal line, encasing the ray, and bear long, robust, cylindro-conical spines which form a single series along the median dorsal line. Abactinal area covered with membrane, beset with simple spiniferous spicules or with pseudo-paxillæ. No specially developed epiproctal protuberance. Actinal interradial area paved with thin, smooth plates, arranged in regular columns, more or less clearly imbricating, and covered with a delicate membrane. Ambulacral furrows narrow and more or less enclosed. Ambulacral spines elongate, needle-shaped, and with a tendency to radiate apart. Cribriform organs three to seven in number in each angle.

STYRACASTER HORRIDUS, n. sp.

Rays five, very long and slender, compressed laterally, and tapering to the extremity. The interbrachial angle is very wide, and its rounding is more or less obliterated by the subpentagonal character of the disk. The lesser radius is in the proportion of 20 per cent.; $R=75$ millim., $r=15$ millim.; $R=5r$. The disk is not high, although capable of being inflated to a slight extent above the level of the marginal plates. Dorsal area covered with a leathery integument, beset with minute, compact, and closely crowded pseudo-paxillæ of 4–8 spinelets, occupying the whole area. The paxillæ are smaller in the immediate centre of the disk, but there is no special protuberance. The actinal portion of the disk slopes downwards, with an inward bending curve from the margin to the mouth-plates, producing a very prominent convexity on the under surface.

Marginal plates deep and almost vertical. Along the whole of the ray beyond the disk the supero-marginal series of either side meet, and, from being bent inwards very slightly, produce the laterally compressed and high-arched character of the ray. The supero-marginal series are 23 in number on one side of a ray, and all the plates are longer than high. Along the whole of the free portion of the ray each alternate supero-marginal plate bears a long sharply-pointed spine on its upper edge; and the spine-bearing plates of the two sides of a ray alternate, the unarmed plate of the one side corresponding to the armed plate of the other; hence it follows that a straight single line of vertically directed spines extends along the whole of the median dorsal line. The spines are robust at the base, conical, and taper to a very finely pointed extremity. The spines are longer than the depth (height) of the ray, and they normally decrease in size as they proceed outwards; but the regularity of this is sometimes broken by the occurrence of a shorter spine here and there. The spines are slightly curved in the plane of the direction of the ray, the point turning outwards. Occasionally a small additional spine is intercalated here and there in the otherwise equally spaced series, in consequence of the corresponding plates of the two sides of the ray each bearing a spine. The terminal plate is rather large, compressed, and elongate, its dorsal surface sloping upwards at an angle of 45° from the general dorsal line of the ray, and its ventral surface is rounded, thereby emphasizing the character of the upturned tip of the ray. The terminal plate bears three spines—one at the extremity in the prolongation of the median dorsal line, and one on either side at a lower level on the furrow-margin, all quite at the extremity and close together. In a large specimen an additional spine is present, larger than the terminal dorsal one, and placed behind it in the median dorsal line of the plate.

The infero-marginal plates are much shallower than the superior series, their length being nearly twice their height. In large specimens they frequently alternate, instead of corresponding, with the companion infero-marginal, especially on the outer part of the ray; and sometimes an intermediate lateral series of plates, almost as large as the infero-marginals, is intercalated between the dorsal and ventral series, and entirely separates them. This intermediate series may be represented by only a few plates on the outer part of the ray, or may be continuous along a considerable portion of the ray. Cribriform organs 7–9 in number in each angle, very wide, and occupy nearly the whole of the plates, in large examples adjacent organs being confluent in the neighbourhood of the horizontal suture; structure papilliform.

The ambulacral furrows are wide when expanded, occupying the whole of the actinal aspect of the ray; but when contracted are arched over and closed in by the ambulacral spines. The adambulacral plates are elongate and subrhomboid, the margin towards the furrow and the ventral surface being incurved, suggesting the appearance of a caudal vertebra. Ambulacral spines four in number, with aboral spine longest, along the greater portion of the ray; near the mouth five spines, short and subequal. The spines are comparatively short, with a wide robust base, thence taper and sharply pointed and slightly compressed, and all radiate at different angles from the plate. On the plates near the mouth the spines are much shorter, subequal, rapidly pointed, and quite flat. The bases of these spines are united by a more or less continuous membrane. In large specimens a small granule is present, behind the ambulacral spines, close to the adoral extremity of the adambulacral plate; and near the mouth even two or three are sometimes found.

Mouth-plates large and prominent, with a widely open median suture, the apposed margins of the plates being bent downward with a gentle curve until at right angles to the plane of the actinal surface. There is a comb of 7 or 8 short, flat spinelets, similar to those on the innermost adambulacral plates, on the margin of the plate which abuts onto the furrow, and one or two more prominent and conical ones at the innermost extremity, directed towards the centre of the peristome. No spinelets or tubercles are present on the surface of the mouth-plates, although in the largest specimen four or five granules form a line parallel with the sutural margin. The actinal interbrachial areas are large and elongate in the prolongation of the median interbrachial line, and are covered with squamous plates, the whole being covered with a thin membrane. The plates are broader than long, imbricate slightly, and are arranged more or less in columns, which latter, however, may become somewhat irregular as they approach the mouth-angle, consequent on the increase in the size of the plates, which are also more irregular in shape. A few small granules very widely and irregularly placed occur on the plates here and there.

Colour, in alcohol, greyish white, the paxillar area and the cribriform organs having a slightly brownish tinge.

Station 346. Lat. 2° 42′ S., long. 14° 41′ W. Depth 2350 fms.; bottom temperature $0^{\circ}{\cdot}4$ C.; *Globigerina*-ooze.

STYRACASTER ARMATUS, n. sp.

Rays five, long and slender, subcylindrical, nearly uniform in thickness throughout their length, the expansion at the base and the attenuation at the tip being very slight. Interbrachial angle very wide, with the curve somewhat flattened in conformity with the pentagonal character of the disk. The lesser radius in the proportion of 28 per cent.; $R=38$ millim., $r=11$ millim. Disk depressed, not inflated, and not higher than the marginal plates. Dorsal area covered with a leathery integument beset with minute imperfect pseudo-paxillæ and simple spiculate spinelets closely crowded, the general appearance being that of spinelets only. Spaces at the base of the rays naked. No definite epiproctal protuberance, a faint indication of the centre only present.

Marginal plates high, curving inward slightly above and below, and forming a rounded margin. The supero-marginal series are 9 in number from the median interradial line to the extremity, exclusive of the terminal, and all are considerably longer than high. Along the rays, commencing at the fourth plate from the arm-angle, the supero-marginal plates of either side meet in the median dorsal line and entirely encase the upper portion of the ray. The ray is rather compressed laterally, and the dorsal surface is arched. Each alternate supero-marginal plate along the ray bears a large robust conical spine placed in the median line of the ray, the series forming a single line of five spinelets, which stand perpendicular to the ray and diminish in size as they proceed outward. The longest spinelet remaining measures about 6 millim., and the tip appears to have been broken. The penultimate supero-marginal plate is small, and the ray is slightly bent upwards at the extremity. The terminal plate is small and comparatively inconspicuous, not at all swollen or tubercular, and is less than the pair of antepenultimate supero-marginal plates. It bears three spinelets, one in the median line above the extremity of the ambulacral furrow, and two beneath, all close together. The infero-marginal plates correspond in number with the dorsal series, but their length is very much greater in relation to their height—fully three times. The four outermost plates do not correspond in breadth with the companion supero-marginal series. Cribriform organs three in number in each angle, rather broad, but well defined; structure papilliform.

Ambulacral furrows very narrow, quite closed-in by the over-arching adambulacral plates and spinelets. Adambulacral plates elongate and vertebra-like, the margin to the furrow being deeply scooped out, the extremities prominent and thickened. Ambulacral spines three, moderately long, sharply tapering and slightly compressed: two stand near the adoral extremity of the margin, equal in length, stretching over the furrow, and radiating apart from one another; the third spinelet is slightly smaller, placed about midway on the margin of the adambulacral plate, and is directed in the same direction as the aboral of the two spines. The spinelets are invested with a very fine membrane, which is continuous at their bases, and the spinelets of one side of the furrow interlock with those from the other. Behind the furrow series, at the adoral end of the plate and standing on the prominent swelling, away from the margin of the furrow, a small conical spinelet rises perpendicularly from the surface of the plate; and this becomes more or less rudimentary as it proceeds along the free portion of the ray.

The mouth-plates, which are large, prominent, and not united along the median suture, have a peculiar appearance, resembling the shape of a coulter in a marked degree. The mouth-spines 5 or 6 in number, placed side by side along the lateral margin of the plate, are the same in length and character as the ambulacral spines, and they interlock with the corresponding spines of the neighbouring mouth-angle. About three small, aborted, tubercular spinelets situated on the surface of the plate are probably the representatives of secondary mouth-spines. The mouth-spines are wide apart and unclosed at their aboral extremity, and expose the odontophore. Actinal interbrachial areas rather large and triangular, covered with squamous ventral plates, which are narrow, elongate, imbricating, and regularly arranged in columns on the outer half of the area, but become larger, broader, subrotund and irregular as they approach the mouth-angle. The plates are smooth, without granules, and the investing membrane is of such remarkable thinness that its presence is almost questionable.

Colour, in alcohol, grey, with a slightly brownish shade over the paxillar area.

Station 224. Lat. 7° 45′ N., long. 144° 20′ E. Depth 1850 fms.; bottom temperature 1°·3 C.; *Globigerina*-ooze.

HYPHALASTER, n. gen.

Rays five, short, incapable of being reverted. Disk more or less depressed and pentagonal. Supero-marginal plates devoid of spines, sometimes uniting in the median dorsal line and enclosing the ray. Abactinal membrane with pseudo-paxillæ; simple spinelets also present in some forms on the outer part of the area only. A conical epiproctal protuberance may be more or less defined in the centre of the disk, similar to that present in some species of *Astropecten*, but not developing the tubular structure of this appendage found in *Porcellanaster*. Actinal interradial areas extensive, paved with numerous thin plates arranged in regular columns and imbricating. Ambulacral furrows narrow and concealed. Ambulacral spines short, compressed, three to five in number, usually forming a kind of fan or independent series on each plate. Cribriform organs five to seven in number in each angle.

Synopsis of Species herein described.

A. Five cribriform organs in each angle. Dorsal area with prominent groups of paxillæ.................. *diadematus.*

B. Seven cribriform organs in each angle. No prominent groups of paxillæ on the dorsal area.
  † Supero-marginal plates meet in the median line. Cribriform organs very narrow. Secondary row of granules behind the ambulacral spines aborted or absent.
    * Disk with very imperfect pseudo-paxillæ. Two innermost supero-marginal plates on each side of the median interbrachial line with small spinelets. Mouth-plates with secondary mouth-spines. Body-frame very thin and delicate.................... *hyalinus.*
    ** Disk with fully developed paxillæ. No spinelets on supero-marginal plates. No secondary mouth-spines. Body-frame robust and rigid............ *inermis.*
  †† Supero-marginal plates not united in the median line. A series of small secondary granules behind the ambulacral spines. Cribriform organs very broad and expanded .... *planus.*

Hyphalaster hyalinus, n. sp.

Rays five, short, small, rounded, and of uniform thickness throughout. Interbrachial angles of great width, the curve being almost lost in the straightness of the side of the pentagonal disk. The lesser radius is in the proportion of 50 per cent.; $R=20$ millim., $r=10$ millim. The disk, although not high, is more or less inflated. Dorsal area covered with a thin and almost transparent membrane, which is indurated with a great number of spiculate spinelets or pseudo-paxillæ; these consist of a circular scale-like base, from the centre of which a spine-like process rises vertically, and this may be divided into two, three, or four equal spinelets, the latter number being the most general in the centre of the disk and those with one spinelet near the margin. The spinelets are moderately robust, obtuse, all united at the base, and radiating apart very slightly, have more or less the appearance of imperfect paxillæ; whilst the squamous basal plate is scarcely larger than the diameter of the vertical spinous process. These pseudo-paxillæ are rather crowded in the immediate centre of the disk, but are elsewhere moderately and uniformly well spaced. There are no papulæ. The presence of an actual anal aperture is doubtful.

Marginal plates form a perpendicular wall of small but uniform height; the upper margin of the superior series and the lower margin of the inferior series are slightly bent inwards and form bevelled edges. The supero-marginal plates are eight in number, counting from the median interbrachial line, exclusive of the terminal. The innermost plates are nearly twice as long as high, and the outermost are higher than long. The two innermost plates on either side of the median interbrachial suture each bear a single, very minute, conical spinelet near the upper margin and directed horizontally. The two outermost supero-marginal plates extend to the median dorsal line, where they join the corresponding plates from the other side of the ray; the two next plates are separated by a narrow strip of dorsal membrane with pseudo-paxillæ; and the remaining plates fall in the disk-margin. The terminal plate is slightly tumid proximally and tapers rapidly to a fine extremity, which is continued in a robust, sharply pointed terminal spine. This spine, which is longer than the plate, is placed in the median dorsal line of the ray, and is directed outward and slightly upward from the horizontal; two smaller spinelets, less than half the size of the above, are placed at a lower level, one on either side of the extremity of the furrow. The infero-marginal plates correspond in number and breadth with their superior companions; their height is less than the length and varies very slightly throughout the ray. Cribriform organs seven in each angle, very narrow, the outermost almost imperceptible; structure papilliform.

Ambulacral furrows narrow and entirely closed-in by the overarching plates and spinelets. Adambulacral plates large and subcrescentic in form, with the extremities truncate, and the incurved margin directed towards the furrow. Ambulacral spines three to each plate, moderately long, slightly tapering, obtuse, and rather compressed, covered with very delicate membrane, which near the base unites with that of the adjoining spines, and forms a rather broad continuous web, by which the spines are bound together in continuous series. The spines are confined to the adoral or inner two thirds of the plate. Three to five small aborted spinelets, little more than granules, stand upon the surface of the plate behind and external to the furrow-series and form an aborted secondary series. The adambulacral plates are separated throughout the ray from the marginal series by a narrow strip of membrane with scale-like plates continued from the interbrachial area.

Mouth-plates large, prominent along the line of suture, forming a broad well-elevated keel in which nearly the whole of the two plates is involved. The aboral extremity slopes gradually, the surface of the interbrachial area being inclined upward to meet it; and adorally they likewise slope gradually. Sutural junction imperfect, widely expanded aborally, exposing the odontophore. Mouth-spines proper six in each plate, *i. e.* 12 for the whole mouth-angle, the innermost one much larger and more robust than the others; there being thus two large spinelets at the innermost point of each mouth-angle directed over the actinostome. The five smaller spinelets are uniform and equal, less than the ambulacral spines, and are arranged equidistantly along the lateral margin of the plate, and arch over the furrow in continuation of the ambulacral spines. About three aborted secondary spines are placed close to the margin of the plate which falls in the median suture; the middle one is largest, subconical, and stands near the highest point of the keel; the most adoral is similar in shape but rather smaller, and is placed midway between this and the anterior extremity; whilst the outermost one is little more than a tubercular granule, and stands equidistant between the middle spine and the aboral extremity. Occasionally the adoral secondary spinelet is largest. A few irregular rounded granules may occur on the aboral portion of each plate.

The ventral interbrachial area is extensive, covered with a thin transparent membrane and with a compact plating of delicate imbricating scales. The scale-like plates are more or less regularly hexagonal and arranged in columns parallel to the median interradial line. The plates diminish in size and depth towards the margin, where they become narrow elongate strips. Each plate bears 2 or 3 small rounded granules irregularly disposed; the large plates near the interior of the interradial area with a few additional granules in proportion to their size.

Colour, in alcohol, greyish white, with a brownish or slightly orange shade over the dorsal membrane.

Station 274. Lat. 7° 25′ S., long. 152° 15′ W. Depth 2750 fms.; bottom temperature 0°·9 C.; radiolarian ooze.

HYPHALASTER DIADEMATUS, n. sp.

Marginal contour stellato-pentagonal. Rays five, well developed, slender, springing from the disk with a gradual taper, which is continued to the extremity; the upper surface of the ray arched rather than rounded. Interbrachial angles well rounded; the lesser radius is in the proportion of 41·6 per cent.; $R=24$ millim., $r=10$ millim. Dorsal surface of the disk slightly inflated above the level of the marginal plates, and with a prominent conical peak in the centre of the area.

Dorsal area covered with a thick integument, uniformly beset with well-spaced pseudo-paxillæ, which are very small and regular, each carrying 3 or 4 spinelets, those with the latter number being by far the most numerous. The paxillæ do not extend along the rays, but are confined to the actual disk-area; a blank space is thus left at the base of the rays, which has the appearance of being closely plated with small round scales imbedded in the integument. In the neighbourhood of the conical peak the paxillæ become very small and crowded. Around this as a centre and at some little distance away, a number of larger paxillæ made up of more spinelets are arranged; these are congregated with more or less regularity into round groups, of which, roughly speaking, there is one opposite the median line of each ray, with a smaller group intermediate between each of the larger ones. The larger groups consist of ten to twelve large paxillæ of about ten spinelets each; and the smaller groups of about five or six paxillæ. Outside this conspicuous ring of the disk there are a few large paxillæ placed here and there amongst the general small or pseudo-paxillæ of the disk.

Marginal plates, instead of forming perpendicular rounded sides, are inclined inwards towards the centre, which gives a bevelled edge to the disk and an arched rather than a rounded character to the upper surface of the rays. The supero-marginal plates do not meet in the median line of the ray, but leave a rather wide suture along the whole length, which expands on approaching the disk. All the marginal plates are longer than high, excepting perhaps the penultimate superior. The superior series are ten in number exclusive of the terminal, and vary in depth very slightly from the arm-angle to the extremity of the ray. The inferior series correspond in number and breadth with the superior series, but diminish gradually in height as they proceed along the ray. The surface of the plates is perfectly smooth, and forms an even contour-line to the ray, the sutures being hardly discernible except with magnifying-power. None of the supero-marginal plates bear spines except the terminal. This plate is comparatively small and inconspicuous, subtriangular in contour, and upturned at a sharp angle from the plane of the ray, a position that gives a very marked character. It bears three rather short robust spines—one, which is somewhat the stoutest, is placed in the median dorsal line and directed vertically upwards; the other two stand at the anterior ventral angles of the plate, and are directed outward and at an angle of about 45° to the single spine. In consequence of the thinning-off of the terminal plate, the bases of these lateral spines are not far removed from that of the dorsal spine; a deep indentation or sinus occurs between them, in which the ambulacral furrow terminates. Cribriform organs five in each angle, rather wide, and leave only a small band of the plate between adjacent organs; each with a depression down the median line; structure papilliform.

Ambulacral furrows deep and contracted; the adambulacral plates arching considerably over, and the ambulacral spinelets covering-in the area when disposed for that purpose. The adambulacral plates are elongate and subcrescentiform, and each forms an angular prominence on the sides of the furrow, the angles separating to a certain extent the sucker-feet of neighbouring segments. Ambulacral spines four to each plate, short, thin and compressed, uniform in breadth throughout and rounded at the extremity, arranged in a straight, or sometimes slightly curved, line and at a very slight angle to the furrow, the direction of the line being outward from the furrow. A secondary row of 5 or 6 small granules stands on the outer margin of the adambulacral plates behind the furrow-series, placed in a slightly curved line; and these become more or less indistinct along the outer portion of the ray.

The mouth-plates are large, prominent, and elevated along the line of suture; the junction is imperfect, and the aboral extremities of the plates being widely open, expose the odontophore. Mouth-spines 6 to 8 on each side, short, compressed and pointed: the innermost one on each side larger and longer than the rest, and directed towards the actinostome; the lateral ones falling into the furrow and interlocking with the corresponding denticles of the neighbouring mouth-angle. A number (varying from 6 to 12) of small granule-like tubercles are present on the superficies of each plate; two, which are slightly largest, stand near the inner third of the plate; whilst the remainder are confined to the aboral half of the plate, and are sometimes arranged in two or three lines and sometimes irregularly. It seems scarcely possible to rank these as secondary mouth-spines; and yet there can be little doubt that they are rudimentary or aborted representatives of these appendages.

The ventral interbrachial areas are triangular in outline, and covered with a regular plating of hexagonal imbricating scale-like plates arranged in columnar series extending from the margin to the furrow parallel with the median interbrachial line. The plates are broader than long, the disproportion increasing as they approach the margin; they bear a few (3 to 5) small, widely-spaced, irregularly disposed granules, some plates here and there having none.

Colour, in alcohol—margins and actinal area greyish white; dorsal membrane bluish grey, with touches of light brown near the margin of the area and occasionally on the groups of paxillæ round the centre of the disk.

Station 299. Lat. 33° 31′ S., long. 74° 43′ W. Depth 2160 fms.; bottom temperature 1°·1 C.; grey mud.

HYPHALASTER INERMIS, n. sp.

Marginal contour stellato-pentagonoid. Rays five, well developed, slender, round, and tapering but slightly. Interbrachial angles very wide and expansive, the curve slightly flattened in the immediate angle, thereby emphasizing the marked pentagonal contour of the body-disk. The lesser radius is in the proportion of 42·5 per cent.; $R=20$ millim., $r=8{\cdot}5$ millim. Disk depressed, not inflated; both dorsal and actinal surfaces stand on a level with the edges of the marginal plates.

Dorsal area covered with closely crowded paxillæ, the whole disk as well as the base of the rays being uniformly packed. The paxillæ are very fine and small, and are made up of about 5 to 10 spinelets; towards the margin of the disk they become smaller and also in the centre, where they are very compact, a slightly prominent peak being formed as in *Ctenodiscus*. A slight elevation of the surface is present in the median radial line, opposite the base of each ray, and at about one third of the distance from the margin to the centre.

Marginal plates occupy the entire margin and represent the whole thickness of the animal, forming perpendicular walls regularly rounded above and below. Along the rays the superomarginal plates meet in the median dorsal line and form a complete casing to the ray, which is well rounded, small, and tapers but slightly. The supero-marginal series are 8 in number (or, with a very small aborted one, 9), exclusive of the terminal. The plates which fall in the margin of the disk proper have the length about equal to their height, but in those along the ray the height is greater than the length. The infero-marginal plates correspond in number and in length with the superior series. In the arm-angle, along the disk proper, the height is about equal to the length and the plates are uniform in size with the superior series; towards the extremity of the ray the height diminishes gradually and the length is greater than the height—a reversal of the relative proportions presented by the plates of the superior series. The marginal plates are smooth and bear no spines, but when examined microscopically have the appearance of being subgranular and built up of a rather open network. The plates of both series are convex outwardly or tumid in a very slight degree, by which means the sutural divisions of the segments are clearly marked out, and a somewhat annulated appearance is given to the ray. The terminal plate is large and conspicuous, appearing somewhat tubercular and directed slightly upwards when viewed in profile, and oval in contour when seen from above. This plate bears three short and rather robust spinelets—one at the terminal extremity of the plate, situated in the median dorsal line, pointing in the direction of the prolongation of the ray, and diverging but little from the horizontal. Below this spine, and at either side of it, at the angle formed by the ventral edge of the plate and the terminal extremity, is a somewhat smaller spinelet, pointing in the direction of the prolongation of the ventral margin of the plate. Cribriform organs 7 in number, narrow and well defined; structure papilliform.

Ambulacral furrows narrow and straight, almost completely closed-in by the overarching adambulacral plates and spines, the sucker-feet, which are arranged in simple pairs, being entirely concealed from view. The adambulacral plates are about half as broad as long, but diminish in size as they proceed outwards; and form along the ray triangular prominences projecting into the furrow. Each plate bears 3 to 4 spines, rather short, rapidly pointed, more or less compressed, invested with membrane, arranged in line along the furrow-margin of the plate and sometimes slightly oblique to the course of the furrow. The row of spinelets can be raised at a right angle to the surface of the plate, so as to allow the sucker-feet to be protruded. Traces of an aborted secondary or external spinelet, represented by a mere granule, may be detected at the adoral extremity of the adambulacral plate, away from the furrow-series.

Mouth-plates moderately large, the inner margins which fall in the median suture being elevated so as to form a rounded elongate tubercular protuberance, the lateral margins being flattened out. Mouth-spines 7 or 8 on each side, similar to the ambulacral spines, excepting the innermost one, which is much larger and stouter. Two large spines are thus conspicuous at each mouth-angle and are directed towards the centre, the series entirely closing the peristome, which is remarkably small. The small mouth-spines upon the margin of the plate interlock with those of the adjacent mouth-angle, and form a continuous series with the ambulacral spines. The rudiments of a secondary mouth-spine, represented by a thorn-like granule, occur on each plate near the median suture and at the highest portion of the keel.

The interbrachial areas are triangular in outline, flat, extensive, and covered with imbricating scales of more or less regularly symmetrical hexagonal form. These plates are broader than long, and arranged in regular series of single columns extending from the margin of the disk to the ambulacral furrow; their breadth diminishes somewhat as they approach the margin, and consequently that of the column also. The adambulacral plates join up to the infero-marginal plates along the whole length of the free portion of the ray, and there is consequently no extension of the interbrachial area along the ray. The imbricating plates bear a few widely-spaced miliary tubercles or large granules upon their surface, usually 4 or 5 to a plate, but upon which they have no definite arrangement.

Colour, in alcohol, grey, the paxillar area being a much darker shade, which shows a strong contrast with the greyish white of the marginal plates.

Station 237. Lat. 34° 37′ N., long. 140° 32′ E. Depth 1875 fms.; bottom temperature 1°·7 C.; mud.

HYPHALASTER PLANUS, n. sp.

Marginal contour stellato-pentagonoid. Rays five, of moderate length, and comparatively slender from the disk outwards. Interbrachial angle very wide, more or less flattened, giving a strongly marked pentagonal aspect to the large disk. The lesser radius is in the proportion of 42 per cent.; $R=35$ millim., $r=15$ millim. Disk depressed and not higher than the supero-marginal plates, although apparently capable of a slight inflation.

Dorsal area covered with small, closely crowded paxillæ, which are limited to the disk proper and extend very slightly onto the base of the rays, the median dorsal line of the ray being covered with membrane beset with small squamiform plates. The paxillæ are small and composed of 4 to 6 short and comparatively robust spinelets, and so closely placed as to almost give the appearance to the disk of being coarsely granulated, when seen without a magnifier. A prominent conical anal protuberance is present in the centre of the disk.

The marginal plates constitute the entire thickness of the animal, and form a well-rounded margin to the disk. Along the rays the supero-marginal plates of the opposite sides do not meet, but are separated throughout the whole extent of the ray by a median dorsal membranous area beset with squamæ. The rays are comparatively slender and well rounded, having a cylindrical appearance, and proceeding somewhat abruptly from the angles of the disk. The supero-marginal plates are 10 or 11 in number, exclusive of the terminal ocular plate; they are rather longer than high, excepting in the one or two outermost plates, where the proportions may even be very slightly reversed. The infero-marginal plates correspond with the superior series, the length exceeding the height throughout the ray. The height of the plates of the inferior series is greater in the angle of the disk than that of the superior series, whilst along the ray it is much less, and it is less also than one half the length of the plate. There is a gradual, but very striking, diminution in the size of the plates of both series as they pass from the disk along the ray. The marginal plates are smooth and covered with a very fine membrane; all devoid of spines excepting the terminal ocular plate. The terminal plate is not large or conspicuous, its size being in serial proportion to the neighbouring supero-marginal plates, and forms a blunt obtusely rounded extremity to the ray, whilst its ventral portion is slightly curved upwards. It bears 3 spinelets or representatives of such appendages—one, which is short, robust, and conical, placed at the extremity in the median dorsal line and directed vertically; and a pair, one placed on either side, at a lower level but quite in front of the dorsal spine. The laterals are probably aborted, being, at least in the specimen under notice, little more than tubercles. Cribriform organs 7 in each angle, very widely expanded, covering nearly the whole of the plates, adjacent organs almost touching in the neighbourhood of the horizontal suture; structure papilliform.

The ambulacral furrows are narrow, and when contracted and closed-in by the spinelets the sucker-feet are entirely hidden from view. The adambulacral plates are elongate and subrhomboid in form, and present an angular prominence towards the furrow, the adoral side of the angle being much shorter than the aboral; from this circumstance results a singularly elegant festooned appearance when the furrow is viewed as a whole.

Ambulacral spines four in number, except close to the mouth, three being placed on the aboral facet of the furrow-margin of the plate, and one on the short adoral facet. The three innermost plates of the furrow immediately succeeding the mouth-plates have 5 or 6 spines, and the angular prominence into the furrow is less pronounced. The ambulacral spines are uniform in size and shape throughout the ray; they are small, short, flat, and terminated abruptly with a lanceolate point, and all are in connexion at their base with the common investing membrane of the plate. Behind the inner or furrow-series of ambulacral spines are 3–5 small granules, arranged in a slightly curved line, which appears to follow the rounded margin of the adoral extremity and the outer side of the adambulacral plate. The most adoral of these granules show a tendency to develop the flat and pointed form of the ambulacral spines; and there is little doubt that they are the representatives of an outer or secondary series.

Mouth-plates large and prominent, each curving down coulter-form until the margins which fall in the median line are at right angles to the plane of the actinal surface. The prominent median keel thus produced slopes with a regular curve ad- and aborally, its longitudinal profile being almost semicircular. The median suture is not closed, but rather widely open, and expands towards the aboral extremity of the plates and exposes a portion of the odontophore. Each plate bears a short, robust, conical, pointed spine at its innermost extremity, the companion spine of the adjoining plate standing parallel. There is thus a pair of short, but conspicuous mouth-spines directed towards the centre of the peristome from each mouth-angle. The remaining mouth-spines are 6 in number and are uniform in size and shape with the ambulacral spines, and are arranged along the margin of the plate which abuts on the furrow. A few prominent granules are present on the surface of the mouth-plates, but do not, in the specimen under description, appear to be arranged in any definite order.

The ventral interbrachial areas are large and extensive, flat, and covered with oblong squamiform plates. On the outer portion of the area these plates are about twice as broad as long, and are arranged in columns parallel with the median interradial line. In the neighbourhood of the mouth-angle and adjoining the adambulacral plates the ventral plates become larger and altered in form and appear independent of the column-series. The ventral area is covered with a very fine and almost imperceptible membrane, plates and membrane together being so thin that traces of the internal organs of the starfish can be seen through them. A number of small irregularly disposed granules are distributed over the area, but seldom more than 2 or 3 on a plate, and often wanting. The imbrication of the plates appears to be very slight in this species, and is perhaps only present in the outer part of the areas.

Colour, in alcohol, grey, with traces of a purple shade remaining here and there upon the paxillar area and on the rays.

Station 157. Lat. 53° 55′ S., long. 108° 35′ E. Depth 1950 fms.; diatom-ooze.

THORACASTER, n. gen.

Rays five, moderately long, cylindrical, and rigid. Disk large. Superomarginal plates united in the median dorsal line and form a cylindrical encasement to the ray. Marginal plates devoid of spinelets. Abactinal area covered with small, closely crowded paxillæ. No central epiproctal protuberance. Actinal interradial areas extensive, paved with plates imbedded in membrane, and carrying numerous, small, uniform, rather closely placed papilliform granules or spinelets. Ambulacral furrows narrow and enclosed. Ambulacral spines short, equal, ranged on the furrow-margin of the plate and forming a lineal series along the ray. Outer portion of the adambulacral plates occupied by small papilliform spinelets more or less definitely arranged. Cribriform organs 14 in number in each interbrachial angle, in the single species known. Terminal plate small, inconspicuous, and unarmed.

THORACASTER CYLINDRATUS, n. sp.

Marginal contour stellate, with large disk and five very narrow cylindrical rays which taper to a point. Interbrachial angle very wide and well rounded. The lesser radius in the proportion of 33·8 per cent.; $R=62$ millim., $r=21$ millim.

Disk slightly inflated, forming a convex surface of low curvature. The dorsal area is covered with very small, compact, and closely crowded paxillæ, which are, however, confined entirely to the disk, in consequence of the junction of the supero-marginal plates in the median line along the whole of the free portion of the ray. The paxillæ are very small and composed of 6–10 small spinelets closely appressed into a fascicule, the whole area appearing to the unaided eye almost like a uniformly granular surface. The paxillæ are a shade smaller in the centre of the disk, which they further define by their arrangement, although no prominent anal peak is produced. The actinal area of the disk is slightly convex and slopes downwards at a small angle to the prominent mouth-plates.

The marginal plates are high, forming a gently rounded margin to the disk, the plates curving slightly inward towards the dorsal and the ventral areas respectively. When viewed from above they are seen to encroach on the dorsal area to a very slight degree, and still less on the ventral. Along the free portion of the ray the supero-marginal plates of the two sides of the ray meet in the median dorsal line and entirely encase the ray; in consequence of the regular rounding of the plates, the ray assumes a perfectly cylindro-conical form, tapering to the tip, and suggesting the appearance of a delicate belemnite.

The supero-marginal plates are 43 or 44 in number, counting from the tip of one ray to the tip of the neighbouring ray, exclusive of the terminal odd plates, the odd number arising from a marginal plate being placed in the median interbrachial line, instead of a sutural division as usual in *Porcellanaster*. All the marginal plates are devoid of spines or tubercles; and in both the superior and inferior series the height is greater than the length, throughout the ray. The infero-marginal plates correspond exactly with the superior series, and their height may also be said to be equal. A few very small conical granules, evidently loosely attached, are present on the surface of the marginal plates, especially on those which border the disk, and chiefly grouped near the ventral margin of the infero-marginal plates and the dorsal of the superior series. The terminal plate is very small and inconspicuous, in no way gibbous or exceeding the natural conformity as tip of the tapering ray, and is entirely devoid of spines. Seen in lateral profile, the tip of the ray shows a very faint tendency to an upward curve, produced by the slightly elevated position of the terminal plate and the curving upward of the ventral area. Cribriform organs 14 in each angle, very narrow; structure papilliform.

The ambulacral furrows are narrow, and when in a state of contraction entirely conceal the sucker-feet. The adambulacral plates are longer than broad, but are quite inconspicuous, their form and even the divisional sutures being masked by the membrane and spinelets with which they are covered. Along the furrow-margin of the plate are 5 ambulacral spines, and the series of these form a continuous straight line throughout the ray, without curve or break of any kind. These spines are short, robust, truncate at the extremity, and flat, their breadth being placed at right angles to the furrow, and all are equidistantly spaced apart. Behind the furrow-series each adambulacral plate bears two irregular series of smaller and subconically shaped spinelets, about three standing at irregular distances next to the inner spinelets, and about five in the outer series. Owing to the irregularity of number and position and their tendency to group, these outer spinelets do not form the definite continuous lineal series presented by the inner or furrow-series of ambulacral spinelets.

Mouth-plates large, and the combined pairs form conspicuous tubercular prominences. The median suture is imperfectly closed and expands at the aboral extremity of the plates, exposing the odontophore. Along the free horizontal margin of the plate range a series of 6 or 7 mouth-spines similar to the ambulacral spines, the innermost being slightly largest. The surface of the plate bears a number of spiniform granules, which are most robust and elongate on the adoral half of the plate. Beyond this these appendages do not appear to present any special arrangement or to form definite series; and they impart a very echinulate aspect to the mouth-angles.

The ventral interbrachial areas are large and covered with membrane and minute, subspiniform, conical granules; these are small, very numerous and rather closely placed, and distributed over the whole area, here and there with a faint appearance of grouping, which seems to suggest the indication of the separate ventral plates. Of the actual outline, arrangement or character of these plates no observations can be made, owing to the uniform and thick covering of membrane with which they are overlaid.

Colour, in alcohol, yellowish white, the paxillar area having a rather browner shade.

Station 89. Lat. 22° 18′ N., long. 22° 2′ W. Depth 2400 fms.; bottom temperature 1°·8 C.; *Globigerina*-ooze.

Family ASTROPECTINIDÆ.

ASTROPECTEN, *Linck.*

Synopsis of Species herein enumerated.

A. With two series of definite spines on the supero-marginal plates.

† Three marginal spines. Ambulacral spines, three in the inner series, and three also in second series, the aboral largest.......................... *brasiliensis.*

†† One marginal spine. Ambulacral spines 4 or 5 in the inner series; outer part of plate occupied by a group of papilliform and equal-sized spinelets.... *brevispinus.*

B. With one series of definite spines on the supero-marginal plates.

† With large, prominent spines on the supero-marginal plates.

* With large well-developed spines on the infero-marginal plates. No naked spaces .... *polyacanthus.*

†† With small spines on the supero-marginal plates.

* The series of supero-marginal spines continuous throughout the ray.

1. Marginal spines 4 in an oblique comb. Ambulacral spines in 3 series, 3 in each.......... *pectinatus.*

2. Marginal spine 1, long and cylindrical, with 2 small companions close behind. Ambulacral spines of the second and third rows frequently grouped, normally 3 in each. A spine on the infero-marginal plate near the adambulacral plates.................................. *acanthifer.*

** The series of supero-marginal spines not continuous throughout the ray.

|| Wanting in the interbrachial angle.

o. Marginal spine 1. Ambulacral spines in 3 series............................ *japonicus.*

||| Wanting on the outer half of the ray, but continuous in the interbrachial angle.

o. Marginal spines 3. Ambulacral spines in 2 series............................ *imbellis.*

C. With only an indefinite spinelet, or several enlarged granules on the supero-marginal plates.

† With 3 ambulacral spines in the second series.

* Marginal spine 1. Outer ambulacral spines very broad and flaring. No aboral line of spinelets on the infero-marginal plates................ *hermatophilus.*

** Marginal spines 4 or 5 in diagonal line. Outer ambulacral spines short, not broad or flaring, placed diagonally. An aboral line of spinelets on the infero-marginal plates...................... *pontoporæus.*

D. With no spinelets on the supero-marginal plates; excepting in some species a very small one on the first or first 4 or 5 in the arm-angle.

† With small spinelets on the first 4 or 5 plates.

* With 4 or 5 spinelets. A well-developed series of pseudo-pedicellariæ............................ *zebra.*

** With 1 spine only, on first plate. No pedicellariæ...................................... *velitaris.*

†† With no spines whatever on the supero-marginal plates.

* Marginal spines 1.

With 2 or 3 ambulacral spines in the second series.

1. Supero-marginal plates broad, with small granules. Paxillæ with 5–8 granules (or spinelets) on the central tabulum ...... *granulatus.*

2. Supero-marginal plates narrow, with large granules. Paxillæ with one granule on the central tabulum .... *monacanthus.*

** Marginal spines 2, side by side.
Infero-marginal plates covered with squamules.
An aboral line of spinelets present. Marginal spines taper and pointed. Supero-marginal plates very broad .... *cingulatus.*
*** Marginal spines 4, in an oblique line.
Ambulacral spines all cylindrical and taper.
Infero-marginal plates with papillose spinelets rather than squamules. No aboral line of spinelets. Supero-marginal plates not very broad. *mesactus.*

ASTROPECTEN BRASILIENSIS, *Müller & Troschel.*

Station. Off Bahia. Depth 7–20 fms.

Station. Off Fernando Noronha. Shallow water.

ASTROPECTEN BREVISPINUS, n. sp.

Rays five. $R=3{\cdot}2\,r$; $R=32$ millim., $r=10$ millim. Rays tapering regularly from the base to the tip and terminating in a point. Breadth of a ray at the base about 11 millim. Interbrachial angles slightly rounded.

Supero-marginal plates 22 in number from the interbrachial line to the tip, higher than broad along the inner half of the ray, but broader than high on the outer portion. Each plate (excepting two or three in the arm-angle and a few at the extremity) bears two small, conical, sharply pointed spines. The inner series are placed close to the inner edge of the plate, and are continuous from the arm-angle until near the tip, decreasing in size as they proceed outward, until they disappear altogether. The outer series are slightly larger, and are placed at the extreme edge of the plate on the rounding where the dorsal and lateral superficies converge; they are continuous throughout the ray, excepting the innermost plate in the arm-angle.

Infero-marginal plates higher than broad, and flush with the superior series. Each plate bears a single marginal spine, short, tapering continuously from base to tip, sharply pointed and slightly compressed. On the inner half of the ray, two similar and slightly smaller spines are situated on the median line of the plate—one, which is the smallest, not far from the inner edge of the plate adjoining the adambulacral plates, and the other about midway between this spine and the marginal spine, the three forming a lineal series transverse in relation to the direction of the ray. On the outer portion of the ray the inner spine is aborted or indistinguishable from the squamules of the plate. When the side or lateral wall of the ray is placed in direct view, the above-mentioned spines of the inferior plates are all visible, and they, together with the spinelets of the superior plates, appear to form a continuous vertical series. The marginal spine is very little, if at all, longer than the outer spine on the supero-marginal plate, and all these spines stand at an angle to the superficies of the plate and are directed upward and outward. Very short, widely spaced, papilliform squamules are distributed over the whole of the infero-marginal plates, and the granulation of the supero-marginal series partakes of the same character and is indistinguishable at the junction of the plates.

The ambulacral spines are short and robust, subpapilliform, and do not taper, and they stand more or less perpendicular to the surface of the plate. The inner series are 4 or 5 in number, and their base-line forms a slight angle projecting into the furrow; the middle spinelets are a shade larger and more robust than the others. The ambulacral spinelets that occupy the rest of the plate behind the furrow-series are little more than elongate papillæ; they are small, stumpy, covered with membrane, and are rather widely spaced, no definite order of arrangement being discernible, although about two irregular rows may be traced in some instances. The spinelets on the ventral plates are similar in character and disposition to the foregoing, and they merge imperceptibly into the squamules of the infero-marginal plates. This uniformity in the dermal appendages imparts a characteristic appearance to the ventral aspect of the starfish.

Mouth-plates elongate, each with two short, flattened, truncate spinelets at the inner extremity, then about six pairs of spinelets, short and robust, standing perpendicular on the surface of the plate and forming two series apposed to one another; and then about four rather broader, shorter, and more robust spinelets, forming a single series in continuation as it were of the two apposed series, at the outer extremity of the plate, towards which the spinelets decrease as they proceed outward. Consequent on this method of arrangement there is a marked division of the mouth-plate armature into two narrow series along the median line of each mouth-angle.

The paxillæ of the dorsal area are small and compact, and composed of six to nine spinelets, of which one is central. The spinelets are short and robust, and are directed upward, their radiation apart being very slight. No definite order is maintained in the arrangement of the paxillæ. The papulæ are small and dark brown, or almost black in colour, and a broad space occurs along the median line of the ray in which none are present. In the centre of the disk there is a large, conspicuous, and well-developed conical prominence, upon and in the neighbourhood of which the paxillæ are greatly reduced in size. No anal puncture is traceable.

The madreporiform body is small and situated at about one third of the distance from the margin to the centre of the disk. The terminal (ocular) plate, though small, is conspicuous and elongately oblong.

Colour, in alcohol, umber-brown, becoming lighter in shade towards the extremities of the rays. The spinelets white. Small specimens yellowish white.

Station 232. Lat. 35° 11′ N., long. 139° 28′ E. Depth 345 fms.; bottom temperature 5°·0 C.; sandy mud.

ASTROPECTEN POLYACANTHUS, *Müller & Troschel.*

Station. Port Jackson, Australia. Depth 2–11 fms.
Station. Admiralty Island. Depth 16–25 fms.
Station. Yokohama, Japan. Depth 5–25 fms.
Station. Kobi, Japan. Depth 8–50 fms.

ASTROPECTEN PECTINATUS, n. sp.

Rays five. $R < 3{\cdot}5\,r$; $R = 48$ millim., $r = 14$ millim. Rays broad at the base, tapering continuously to the extremity, which is finely pointed. Breadth of a ray at the base 16·5 millim. Interbrachial angle subacute or very slightly rounded.

Supero-marginal plates 21 in number from the interbrachial line to the tip, higher than broad, the disparity being greatest in the arm-angle and diminishes towards the extremity. When seen abactinally the plates have the appearance of being slightly oblique in relation to the direction of the ray, and each, excepting the two innermost, is slightly convex or submammillate at the outer angle formed by the junction of the dorsal and lateral superficies of the plate, which falls in the marginal contour of the ray. On the summit of this convexity is borne a small short conical spinelet; and although normally the series of spinelets is continuous throughout the ray, a plate occasionally occurs on which the spine is wanting. The two inner supero-marginal plates are narrower dorsally than the others, and the spinelets they bear are slightly longer and more robust.

The infero-marginal plates are broader than high, and do not extend laterally beyond the superior series. Each plate bears an oblique comb of four marginal spines, their line of base forming an angle of about 45° passing from the adoral side to the aboral side of the plate. The adoral spine is the smallest and the most outward, and the third from the margin the longest, the second is intermediate in size, and the fourth nearly as long as the third. A fifth and much smaller spine is situated on the aboral side of the plate a little distance from the comb or marginal series; and in the inner portion of the ray one or even two similar isolated spines may be present on the aboral side of the plate in lineal series. All these spines, as well as the marginal series, are elongate, delicate, cylindrical, and taper to a fine point; and the marginal spines are very slightly bent. The whole of the surface of the infero-marginal plates is compactly covered with small, flat, roundly tipped squamules, uniform and closely placed.

The ambulacral spines are arranged in three distinct series, three spinelets in each. The inner series are of moderate length, the middle spine being slightly longest, subcylindrical, and slightly tapering, whilst the companion spinelets are often slightly flattened. The second series consists of three equal spinelets, which are shorter than the inner series, and are flat and expanded towards the tip, which is roundly truncate. The outer series, likewise of three spines, are similar to those of the second series, the middle spinelet, however, being usually broader and more flaring than the companions; occasionally there may be an additional small spine present in this series. The inner series are directed more or less over the furrow; the second series are usually perpendicular; and the outer series are directed outward towards the margin of the ray. There is also a tendency in the spinelets to radiate apart. Consequent on this mode of arrangement, the armature of the adambulacral plates has a very widely expanded character on the whole.

The ventral plates are small and very few in number, and confined to the immediate interbrachial area. The spinelets that cover them are small, more or less subspatulate in form, and radiate apart.

The mouth-plates are of moderate size, each pair forming a subtubercular prominence; the whole surface covered with small robust papilliform spinelets, forming two or three lineal series on each plate. These spinelets increase in length towards the inner extremity, the innermost ones not being greatly longer or more prominent than the rest.

The paxillæ of the dorsal area are large and uniform, and are arranged in regular transverse lines which extend up to the median line of the ray. The paxillæ have a large tabular surface on which are placed twelve to fifteen short papilliform spinelets, and the periphery is surrounded by about an equal number of similar spinelets. In the centre of the disk the paxillæ are smaller, and are very compactly placed. There is no trace of any anal puncture, and no protuberance in the centre of the disk.

The madreporiform body is very small, and is situated at about one third of the distance from the margin to the centre, and sometimes rather further away from the margin even than this. In some specimens there is a faint depression along the median line of a ray; and in large examples a similar slight sulcus occurs on the outer portion of the median interbrachial line.

Colour, in alcohol, a light purplish shade, of which only a trace remains in some specimens, the rest being almost ashy white.

Station. Port Jackson. 6–15 fms.

Station 161. Off entrance of Port Philip. Depth 38 fms.; sand.

Station 162. Off East Moncœur Island, Bass Strait. Depth 38–40 fms.; sand.

ASTROPECTEN ACANTHIFER, n. sp.

Rays five. $R > 6{\cdot}5r$; $R = 90$ millim., $r = 14$ millim. Rays elongate and tapering; disk very small. Breadth of a ray at the base 14·5 millim.; interbrachial angles acute. Supero-marginal plates rather higher than broad, 43 in number from the interbrachial angle to the tip. Each plate bears on the outer dorsal margin (or rounding that falls in the marginal contour) a single, small, delicate, conical, and sharply pointed spine. The series is continuous throughout the ray; and the two innermost spinelets are rather more robust than the others.

Infero-marginal plates broader than high, and do not extend beyond the superior series. Marginal spines three, close together in transverse series: the outermost, or marginal spine proper, is long, delicate, cylindrical, tapering to a sharp point, and slightly bent; the second, which stands immediately behind, is about two thirds the length and precisely similar; the third spine is very small, not more than one third the length of the preceding, and is hardly worthy of being ranked as a marginal spine. Sometimes a small spinelet similar to the last mentioned stands by the side of the second marginal spine. No other spinelets are present on the infero-marginal plates excepting a single isolated spinelet in the median line and near the inner end of the plate adjacent to the adambulacral plates. This spinelet is cylindrical, taper and sharply pointed, and somewhat longer and more robust than the third marginal spine; its presence and isolation gives a very characteristic appearance. The surface of the infero-marginal plates is covered with small and not very closely crowded papilliform squamules, which increase slightly in length and robustness at the inner end of the plate near the adambulacral plates.

Ambulacral spines not very large or prominent. Innermost furrow-series three in number, delicate, cylindrical, taper; the middle spine slightly more prominent in the furrow than its companions. Outer spinelets difficult to formulate, in consequence of irregularity in their mode of arrangement. Normally a second and an outer series are present, having about three spinelets in each; but these are often placed in such a way as to appear to give two to the second series and four, arranged diamond-wise, to the outer series; frequently, also, one or two small additional spinelets may be present, usually in the latter series, which then forms a group. The second series are shorter than the inner series, and are slightly compressed and faintly subspatulate. The outer spinelets are shorter than the preceding and are not flattened; their length near the middle of the ray is very slightly in excess of the length of the papilliform squamules of the adjacent ventro-marginal plate. Very few ventral plates are present, and bear spinelets similar to the outer ambulacral spines, and these are usually grouped together into an incipient pedicellaria (?).

Mouth-plates elongate, and covered with comparatively long, closely-placed spines, which are flattened and more or less subspatulate. The two inner spinelets, placed side by side on each plate, are longer and larger than the rest; and these, together with their smaller lateral companions, form a horizontal comb of 6–8 spinelets directed towards the centre of the mouth. Behind these inner spinelets follow two or three shorter spines in lineal series on the surface of the plate; and these are succeeded by 8 or 9 pairs of short flat spines, closely placed and occupying the middle portion of the surface, on which they stand perpendicular; and the outer part of the plate carries 3 or 4 spines in single line directed outward, their length and robustness increasing as they recede from the mouth. The next adambulacral plate to the mouth-plates is narrow, and the spines thereon are small, uniform, and arranged in two single lineal series apposed to one another.

The paxillæ of the dorsal area are large and form a compact surface. Each consists of four or five short granuliform spinelets in the centre of the tabulum surrounded by a circle of a dozen or more short delicate obtuse spinelets, the central four having a rather isolated appearance within the circle. A very large conical prominence is present in the centre of the disk. The madreporiform body is obscured by paxillæ.

The ambulacral sucker-feet are small and terminate in a point, which is tipped with black and gives a very singular appearance to the species.

Colour, in alcohol, yellowish grey.

Station 192. Lat. 5° 42′ S., long. 132° 25′ E. Noon. Depth 129 fms.; mud.

ASTROPECTEN JAPONICUS, *Müller & Troschel.*

Station. Off Yokohama, Japan. Depth 8–14 fms.; 5–25 fms.

Station 233 A. Kobi, Japan. Lat. 34° 35′ N., long. 135° 10′ E. Depth 8–50 fms.; mud, sand.

Station 233 B. Lat. 34° 20′ N., long. 133° 35′ E. Depth 15 fms.; mud.

ASTROPECTEN IMBELLIS, n. sp.

Rays five. $R < 3{\cdot}5r$; $R = 24$ millim., $r = 7$ millim. Rays rather narrow, especially on the outer part, tapering continuously from the base to the extremity. Breadth of a ray at the base about 7 millim. Interbrachial angles subacute.

Supero-marginal plates 18 in number from the interbrachial angle to the tip, about as broad as high, but higher in the inner part of the ray. The plates are slightly tumid, and form a well-rounded margin to the ray. The surface of the plates is covered with very fine, closely-placed, papilliform granules; and the 8 or 9 innermost supero-marginal plates bear a small, delicate, sharply pointed spinelet about equal in length to the length of the plate, and placed near the middle of the dorsal portion of the plate. The breadth of the plates is very little greater than the length on the inner portion of the ray; and on the outer portion these proportions are reversed.

Infero-marginal plates broad, gently rounded on to the actinal surface, and do not extend beyond the superior series. Marginal spines 3, placed close together in a very oblique series, the second from the margin being slightly longest and most robust; all are exceedingly delicate, needle-like, and very faintly bent, the longest being rather more than twice the length of the plate. On the three innermost plates the upper or outer spine is the longest; it is also flattened and much broader than elsewhere. Excepting on the three innermost plates no other spines occur; on these, however, one or two very small ones are present in the median line. The surface of the infero-marginal plates is covered with numerous minute papilliform squamules closely placed, which become more spiniform towards the margins. Ventral plates not more than two or three present, covered with short papilliform spinelets similar to those just noticed.

Ambulacral spines short, delicate, cylindrical, slightly tapering at the tips, forming two series. The inner series consists of three spines; the middle slightly longest, radiating apart and directed over the furrow. The outer series consists likewise of three similar and equal spinelets usually directed towards the margin of the ray; and occasionally there may be one or two supplementary spinelets, usually smaller, and almost indistinguishable from the spinelets of the infero-marginal plates; occasionally one is as large as the three spinelets of the outer series, and is irregular in position.

Mouth-plates small, and form a prominent narrow keel along the median suture-line, on either side of which are borne two rows of rather elongate cylindrical spinelets, 6 or 7 in each, and 2 or 3 in single series on the outer part, which are larger. The innermost spinelets are more robust than the others, but only very slightly longer, and no prominent horizontal comb is formed over the mouth-opening as in other species. There is a row of 5–7 rather elongate spinelets on the free margin of the mouth-plate.

The paxillar area has a comparatively open and irregular appearance in consequence of the character of the paxillæ; these have short thin pedicels scarcely forming a true tabulum, and are surmounted by 8–10 rather long delicate spinelets, much longer than the pedicel, and do not usually radiate apart widely. In consequence of the rather wide separation of the paxillæ, a somewhat "draggled" appearance is produced. In the centre of the disk the paxillæ are rather smaller and more crowded, and a central prominence is present.

Madreporiform body small, and almost concealed by paxillæ, situated rather more than its own breadth from the margin.

Ambulacral sucker-feet moderately robust and with conical pointed tips.

Terminal (ocular) plate rather large, and broader than long; distinctly appearing as if formed by the lateral union of two semicylindrical plates, with a rather large tubercular granule on either side at the extreme tip, on which spinelets were probably articulated.

Colour, in alcohol, yellowish grey, with a darker tint over the paxillar area approaching greenish grey.

Station 204. Lat. 12° 43′ N., long. 122° 10′ E. Depth 100–115 fms.; mud.

ASTROPECTEN HERMATOPHILUS, n. sp.

Rays five. $R>3r$; $R=25$ millim., $r=8$ millim. Rays of moderate breadth, tapering from the base to the extremity, but do not become attenuate or sharply pointed. Breadth of a ray at the base 8·5 millim. Interbrachial angles slightly rounded.

Supero-marginal plates 22 or 23 in number from the interbrachial line to the tip, slightly broader than long; height greater than length, and increasing on the inner portion of the ray, where it is greater than the breadth. The plates are slightly tumid and well defined; and are covered with low rounded granules, which are larger and more prominent in the middle of the plate. Normally each plate bears a prominent spiniform granule on the rounding between the dorsal and lateral surfaces; and occasionally a second may be present close beside it. Usually one or two of the innermost plates on either side of the median interbrachial line carry two of these spiniform granules, of equal size.

The infero-marginal plates do not protrude beyond the line of the superior series, and are gently rounded on to the actinal area. Each plate has a single, short, slightly compressed, and sharply tapering marginal spine, followed by two similar but shorter spinelets, placed close behind and forming a line slightly oblique to the median line of breadth of the plate. The second spine is about two thirds the length of the marginal spine, and the third is much less and more compressed. This triplet of spines is confined to the marginal edge of the plate, and no other spines are present, except on one or two of the innermost plates, the rest of the plate being covered with small uniform squamules; and these, though short, are more or less spatuliform and with rounded tips. Ventral plates only two or three present, bearing small uniform papilliform spinelets.

Ambulacral spines short, normally forming two series; but on some plates the outer series is somewhat irregular, and may simulate the appearance of three series. The inner or furrow-series consists of three spines, of which the middle one is longest, straight, cylindrical, and tapering; whilst the two lateral ones are short, delicate, compressed in the direction of the axis of the ray, slightly expanding towards the tip, and truncately rounded. The outer series are three in number, equal in size, broad, robust, flatly compressed in the direction of the axis of the ray, widely flaring towards the extremity and truncate. The middle spinelet is on some plates placed external to the two lateral ones, and sometimes, in consequence, appears like a solitary spinelet of a third series. Sometimes also the aboral lateral spinelet may be slightly in advance. On a few of the innermost plates one or two supplementary spinelets may be present.

Mouth-plates large and prominent, with a single line of short robust papilliform spinelets upon the surface of the keel along either side of the median suture; these are about 10 or 11 in number, and decrease in size ad- and aborally. Of the mouth-spines proper situated on the free margin of the plates, the three innermost on either side of the suture-line are long, robust, cylindrical, obtusely rounded, and form, together with the corresponding spines of the companion plate, the comb which stretches horizontally over the mouth-aperture. On the remaining portion of the free margin are 3 or 4 small, equal-sized, cylindrical spines. The first adambulacral plate next to the mouth-plate is narrow, with a biserial armature, consisting of about 8 small, compressed, slightly flaring, and truncate spines in each row.

The paxillar area is compact and uniform, rather more than three times the breadth of the supero-marginal plates at the middle of the ray. The paxillæ are longer on the disk and along the median dorsal line than at the sides of the rays, where they are arranged in regular transverse rows, about 5 in each. The larger paxillæ have a circlet of 10–12 short spinelets surrounding a rather large tabulum, on which 1–3 low granules are placed; and the smaller ones have about 8, with one central. The paxillæ are smaller and very compact in the centre of the disk, and a prominent conical peak is present.

The madreporiform body is transversely oval in form, and not more than its own breadth distant from the marginal plates.

The terminal plate is large and broad, very deeply channelled anteriorly, and with 2 or 3 short robust spinelets, which curve slightly over the furrow.

Colour, in alcohol, very light ochre-brown, almost verging towards grey.

Station 75. Lat. 38° 37′ N., long. 28° 30′ W. Depth 450 fms.; sand.

ASTROPECTEN PONTOPORÆUS, n. sp.

Rays five. $R=3{\cdot}5\,r$ app.; $R=53$ millim., $r=15$ millim. Rays rather broad throughout, and only slightly tapering until near the extremity, which, although pointed, is rather obtuse. Breadth of a ray at the base 16·5 millim. Interbrachial angles subacute, or with a faint tendency to rounding.

Supero-marginal plates 27 or 28 in number from the interbrachial angle to the tip, broader than long; height about equal to breadth at mid arm, but greater in the inner portion of the ray. The plates are well rounded and tumid, which gives them a crested or subtubercular appearance and clearly defines the separate plates. The plates are covered with small papilliform granules, which decrease in size towards the margins; and each plate normally bears an elongate granule or aborted spinelet, situated rather low down on the rounding between the dorsal and lateral surfaces of the plate; but not unfrequently two or three may be present, and these stand in transverse line along the median line of breadth.

Infero-marginal plates broad, rather sharply rounded on to the actinal surface, and do not protrude beyond the level of the superior series. Marginal spines 4 or 5 in an oblique line, only slightly inclined to the axis of the ray, passing from the adoral to the aboral side of the plate. The spines are short, cylindrical, tapering, and pointed; the third or fourth from the adoral end of the line is the longest, although there is no great disparity in the length of any of them excepting the first, which is very small. Two or three irregular rows, with the spinelets in each shorter than those in the preceding row, stand behind the marginal series, and form a gradual transition into the spiniform squamulation of the plate. Consequent on this arrangement the marginal spines have a short, compact, and almost tufted appearance; whilst the series form a thick and closely crowded fringe along the ray. The squamules of the infero-marginal plates are rather long, flat, and rounded or obtusely pointed at the extremity, and although numerous they are not very closely placed. Three or four more prominent squamules, simulating spinelets, form a line along the aboral margin of the plate, and occasionally similar ones may be found here and there on other parts of the plate. Ventral plates not more than 6–8 present, carrying very small, short, and equal-sized papilliform spinelets, which appear to form a kind of pedicellaria.

Ambulacral spines short, and forming two series. The inner series, consisting of three spines, short, cylindrical, slightly taper and obtuse, the middle one being more robust, compressed laterally, geniculated and prominent in the furrow. The outer series, near the middle of the ray, has three spines equal to, or rather longer than, the inner series, more robust, slightly compressed, and obtusely rounded at the tips, running obliquely across the plate, the adoral spinelet often being in the position of a third series. On the inner portion of the ray one or two supplementary spinelets may be present, external to the oblique line of three spines above mentioned.

Mouth-plates elongate, and form a long prominent narrow keel along the line of suture. Upon the keel there is a single line of spinelets on each plate, rather long, robust, compressed, and subpapilliform; these are 7–9 in number, and diminish in size aborally. On the outer free margin of the plate there are about 8 spinelets—the three innermost, which with the corresponding spinelets of the companion mouth-plate form the comb of spines projecting horizontally over the mouth, are longer than the rest, and are slightly curved inward at their extremities in the direction of the horizontal plane of the mouth-area. The remaining spinelets are much smaller and equal-sized, and their series do not reach beyond a line drawn at right angles through the middle of the median suture-line.

The armature of the first adambulacral plate beyond the mouth-plates consists of 15 or more pairs of small equal papilliform spinelets, ranged in two parallel lines and apposed to one another, which form a remarkably elegant organ probably of pedicellarian functions. On the outer portion of the second adambulacral plate there is a partial repetition of this arrangement.

The paxillar area is wide and extensive, with numerous rather small compact paxillæ. The spinelets of which these are composed are short and uniform. The larger paxillæ have a circlet of 12–14 spinelets surrounding 7 or 8 on the centre of the tabulum; and the smaller paxillæ present about half those numbers. Along the sides of the rays the paxillæ are arranged in regular transverse lines about 5 or 6 in each. The paxillæ diminish greatly in size in the neighbourhood of the centre of the disk and towards the ends of the rays.

The madreporiform body is small but tubercular, and is situated nearer the margin than midway to the centre.

The terminal plate is moderately large and broad, and is deeply grooved at the extremity.

Colour, in alcohol, yellowish white.

Station. Simon's Bay, Cape of Good Hope. Shallow water; 5–20 fms.

ASTROPECTEN ZEBRA, n. sp.

Rays five. $R=3{\cdot}7\,r$; $R=34$ millim., $r=9$ millim. Rays rather narrow, and although tapering gradually from the base to the extremity, the tip is comparatively obtuse. Breadth of a ray at the base about 9 millim. Interbrachial angles distinctly rounded.

Supero-marginal plates 25 in number from the interbrachial angle to the extremity, higher than broad, and having the appearance of forming a rounded sloping bevel to the ray, especially in the arm-angle. The plates are uniformly covered with papilliform granules, and bear no spines or tubercles whatever, excepting the four innermost plates on either side of the median interbrachial line. These four or five plates are armed with a short, conical, and slightly compressed spinelet, the innermost being longest and the others decreasing in size as they proceed outward.

Infero-marginal plates much broader than high, and do not extend beyond the superior series, although in large specimens there is a tendency to appear to do so in consequence of the presence of a slight prominence on the plate on which the marginal spine is articulated. One marginal spine of moderate length, taper throughout and sharply pointed, cylindrical, very slightly flattened, accompanied by a second spine, about two thirds the length of the marginal spine, placed immediately behind and close to the aboral side of the plate. Two or three small compressed spinelets are situated in line on the aboral side of the plate, that near the inner extremity adjacent to the adambulacral plates often slightly largest. No other spines are present on the inferomarginal plates, which are covered with moderately well-spaced squamules.

Ambulacral spines forming three series on the inner part of the ray, but become reduced to two on the outer portion. The inner series consists of three spinelets, which are rather short, the middle one delicate and clavate at the extremity, and two lateral companions rather shorter, flat and obtuse. The second series consists of two or three spinelets shorter than the inner series and more or less flattened and truncate. When a third spinelet is present it is very frequently placed somewhat behind the other two, opposite their interspace; and might almost be counted with the third series, which latter may consist of only two or three small cilia-like spines or of four flat modified spines forming a well-developed pedicellaria. These organs are irregular in their occurrence and are only present on the inner half of the ray; on the outer part of the ray the third series of ambulacral spines is apparently wanting altogether. The pedicellariæ are large and conspicuous, and four or five are present along each side of a furrow, usually on alternate plates; all are uniform and with four valves, regularly apposed two and two, the spinelets which form the valves being more or less flattened and arched, and terminate in an abruptly pointed or lanceolate extremity. Ventral plates very few; the two immediately behind the mouth-plates each bear a large pedicellaria similar to those just mentioned.

Mouth-plates elongate and narrow, with a single line of comparatively long and robust spinelets along their superficies, cylindrical or slightly compressed and obtuse; all nearly uniform in size excepting the innermost one or two, which are somewhat larger than the others.

Paxillæ of the dorsal area large, having 1–4, or even more, central spiniform granules on the tabulum, surrounded by 8–12 short spinelets in a circle on the periphery. A slight prominence is present in the centre of the disk of some examples, but scarcely sufficient to produce a conical peak. In one specimen a slight invagination occurs in the centre of the prominence.

Colour, in alcohol—the paxillar area is of very light brown or chocolate-colour, and is mottled with spots and lines of a darker tint of the same. These marks fall in a line parallel with, and midway between, the marginal plates and the median dorsal line. On the inner third of the ray the line or band of colour is generally continuous and meets the corresponding band of the adjacent ray on the disk, forming a V-shaped mark, thickened in the angle. On the outer part of the ray the markings are discontinuous, forming spots, and these frequently extend up to and over the marginal plates. The actinal surface and sucker-feet are yellowish white.

Station 186. Lat. 10° 30′ S., long. 142° 18′ E. Depth 8 fms.; coral-sand.

ASTROPECTEN ZEBRA, var. ROSEA.

The examples of *A. zebra* from Station 186 are very constant in their characters. The specimens from Station 187 (three in number) present some variation. In colour they are a rosy brown, approaching that of madder-brown, and the markings are dark brown. The actinal surface is a delicate rosy pink, and the sucker-feet are rich scarlet. The rays are slightly broader and taper rather more rapidly at the tip. Only the two or three innermost supero-marginal plates bear spines, which are smaller and almost invisible excepting the innermost. The small spinelets on the aboral margin of the infero-marginal plates do not form the continuous line noted in the specimens from Station 186, but are wanting in the median portion, thus leaving the spinelet near the adambulacral plates isolated, and the spinelet near the marginal spines is relatively larger and might almost be counted along with the marginals.

Station 187. Lat. 10° 36′ S., long. 141° 55′ E. Depth 6 fms.; coral-sand.

ASTROPECTEN VELITARIS, *von Martens.*

Station. Amboina. Depth 100 fms.; 15–25 fms.

ASTROPECTEN GRANULATUS, *Müller & Troschel.*

Station 188. Lat. 9° 59′ S., long. 139° 42′ E. Depth 28 fms.; mud.

ASTROPECTEN MONACANTHUS, n. sp.

Rays five. $R > 3{\cdot}5\,r$; $R = 26$ millim., $r = 7$ millim. (another specimen, $R = 22$ millim., $r = 6$ millim.). Disk moderately large; rays rather long and narrow, tapering rather rapidly on the outer portion to a pointed extremity. Interbrachial angles rounded. Breadth of a ray at the base 6·25 millim.

Supero-marginal plates small, about 23 in number from the interbrachial angle to the tip, higher than broad, not tumid, forming an even and well-rounded margin to the ray; the extension on the dorsal surface small, consequent on the narrowness of the plates. The surface of the plates is covered with large, flat-topped, well-spaced granules, which diminish a little in size at the margins; and the suture or furrow between neighbouring plates is almost hidden. The usual fine cilia, if present, are entirely concealed. No spinelets or tubercles of any kind are borne on the supero-marginal plates.

Infero-marginal plates much broader than high, do not extend beyond the superior series, and have a sharp subangular rounding on to the actinal surface. Each plate bears a single marginal spine, and no other spines are present, the whole surface of the plate being covered with moderately well-spaced, small, flat, subacuminate squamules very little longer than broad. Two of the squamules immediately behind the marginal spines are longer than the rest and subspiniform. There is no tendency to spinulation on any other part of the plate. The marginal spines are short, delicate, subcylindrical, slightly compressed, tapering from the base to a very finely pointed extremity, and are very faintly curved: they are directed horizontally from the ray at right angles to the axis, and are wide apart; those in the middle of the ray are slightly longer than the others, which decrease in length towards the inner and outer portions of the ray; the longest spines are nearly equal to the length of three infero-marginal plates. Not more than two or three ventral plates are present, and these carry small papillose spinelets forming an incipient pedicellaria-like group.

Ambulacral spines short and rather robust, forming two distinct series, three in each. The inner series consists of three short, robust, obtusely-tipped spinelets, radiating apart and arching over the furrow, the middle spine longest. The outer series of three spines are much shorter than the inner series; the middle spinelet slightly longest and twice as robust as its companions, this spinelet having a short, flat, subspatulate form. The aboral spinelet is smallest and is placed in advance of the other two, its position almost suggesting that it ought to be reckoned as belonging to a middle series, an idea which is further strengthened by the presence in the innermost portion of the ray of a minute granule or rudimentary spinelet in a corresponding position on the adoral side of the plate. This arrangement causes the broader middle spinelet at first sight to appear as the aboral of two spines which form a true outer series, directed outward towards the margin of the ray.

Mouth-plates elongate and narrow, with a single row of 8–10 papilliform spinelets on their surface, which are very small outwardly, but increase in length as they approach the mouth, the innermost spine being longer than any of the others and directed horizontally. The two series of spinelets on the companion plates of a mouth-angle are generally apposed to one another. On the free margin of the mouth-plate there is a lineal series of short, rather robust spinelets directed horizontally, which increase in length as they approach the inner extremity of the plate, the innermost spinelet being very little shorter than the innermost spinelet of the superior series just mentioned, and, standing at the same level, forms together with it the horizontal fan of mouth-spines which proceed from each mouth-angle and cover the mouth. The adambulacral plate adjoining the mouth-plates is much broader and shorter than the others, and bears a lineal series of 8 or 9 short papilliform spinelets on either side, the two series being apposable.

The paxillar area is wide, measuring more than three times the width of the supero-marginal plates near the middle of a ray, and is very regular in composition. The paxillæ are large and well spaced, and have one large granule-like spinelet in the centre of the tabulum, and 7 to 10 very short clavate spinelets on the circumference radiating out widely, almost horizontally. Occasionally on the disk, paxillæ have 2–4 central granules; but the single, large-sized, low granule is very characteristic. On the sides of the rays the paxillæ are arranged in transverse lines about 3 or 4 in each; the median dorsal band scarcely defined. In the centre of the disk an anal peak is present, in the neighbourhood of which the paxillæ become very small and crowded. In some cases the centre of the cone is invaginated.

Madreporiform body entirely hidden by paxillæ.

Colour, in alcohol, ashy grey.

Station 203. Lat. 11° 7′ N., long. 123° 7′ E. Depth 12 to 20 fms.; mud.

ASTROPECTEN CINGULATUS, n. sp.

Rays five. $R > 3r$; $R = 28$ millim., $r = 9$ millim. Rays rather short and of moderate breadth, tapering gently with a slight curve to the extremity, which is not sharply pointed. Breadth of a ray at the base 10 millim. Interbrachial angles subacute and not rounded.

Supero-marginal plates 19 in number from the interbrachial line to the tip, all much broader than high, the breadth of those midway on the ray being greater than the adjacent paxillar area. The breadth of the supero-marginal plates increases towards the arm-angle, where the maximum is attained; the innermost plate of each ray, which is contiguous to the median interbrachial line, is triangular or wedge-form, the apex being directed outward; whilst the bases of the two adjacent triangles form a wide rounding to the inner contour-line of the marginal wall. The border formed on the dorsal surface by the marginal plates is very broad and conspicuous.

The length of the supero-marginal plates in the inner half of the ray is not more than one third of their breadth. The plates are slightly tumid along the median line of breadth, which produces a slight furrow between each; and the surface of the plate is covered with closely-placed uniform granules, which become finer along the margins. No spinelets, tubercles, or enlarged granules are present on the plates.

Infero-marginal plates broader than high, and extend very slightly beyond the superior series. Marginal spines two, standing side by side, equal in length, short, very delicate, cylindrical or faintly flattened, tapering to a sharply-pointed extremity and slightly bent. Behind these stand 2 or 3 very small delicate spinelets; and a row of 4 or 5 similar, though somewhat smaller, spinelets are placed on the aboral side of the plate. The surface of the plate is covered with small, flat, subcircular squamules, rather widely spaced, the margins being bordered with crowded short, delicate, ciliary spinelets, hidden in the divisional furrows. Only two or three ventral plates are present in the immediate interbrachial area; these carry usually one moderately long tapering spinelet surrounded by a marginal series of papilliform spinelets.

Ambulacral spines usually forming three series, although the third or outer series is often absent or indistinguishable from the ciliary spinelets of the ventro-marginal plates on the outer part of the ray. Inner series three in number, short, cylindrical or flattened transversely, slightly taper, the middle one a little longer than the companion spines and standing forward prominently in the furrow. The second series has usually two spines standing wide apart, opposite the two outer spines of the furrow-series ; these spines are shorter than the inner trio, flattened in the plane of the axis of the ray, do not taper, and are roundly truncate at the extremity. Sometimes a third spinelet, similar in size and shape, is present between them. The outer series consists of three small papilliform spinelets, only slightly longer and more robust than the transitional or ciliary spinelets above mentioned.

Mouth-plates small and narrow, with a single line of rather long compressed spinelets, standing perpendicular to the superficies, excepting those near the inner extremity, which are directed horizontally over the mouth and are also larger and more robust; those at the outer extremity are directed outwards. Low down on the sides are a few small and irregular supplementary spines.

The paxillar area is very limited in consequence of the great breadth of the supero-marginal plates. The paxillæ are large upon the disk, but become smaller along the rays ; the former have four or five rather large granules in the centre on the tabulum, surrounded by a dozen or more small short spinelets. Along the rays there are not more than two or three central granules, and these are arranged in line, the paxilla (tabulum) being more or less elongately oval in the direction of the axis of the ray. The paxillæ are closely placed. In the centre of the disk a small conical elevation is present, upon and in the neighbourhood of which the paxillæ are smaller.

The madreporiform body is about its own width distant from the marginal plates, and is almost hidden from view by the paxillæ.

Colour, in alcohol, almost pure white.

Station 122. Lat. 9° 5′ S. to 9° 10′ S., long. 34° 49′ W. to 34° 53′ W. Depth 350, 120, 32, and 400 fms.; mud.

There is, unfortunately, no indication as to which of these dredgings the specimen came from.

ASTROPECTEN MESACTUS, n. sp.

Rays five. $R=3\,r$; $R=34$ millim., $r=11$ millim. Disk of moderate size and somewhat tumid ; rays rather short and moderately broad at the base, tapering continuously to a finely pointed extremity. Breadth of a ray at the base about 11 millim. Interbrachial angle rounded.

Supero-marginal plates small, 21 in number from the interbrachial line to the tip, about as high as broad and slightly tumid; covered with papilliform granules, uniform in size and not very closely placed. Fine cilia in the furrows between successive plates. No spines or tubercles of any kind present on the supero-marginal plates.

Infero-marginal plates broader than high, the height being proportionally greater than usual in the genus; they do not extend beyond the level of the superior series, and form a gently rounded curve onto the actinal surface.

Marginal spines very small, short, straight, taper, and slightly compressed; four in number, placed close together in an oblique line passing from the adoral extremity of the marginal end to the aboral side of the plate, the third from the margin being the longest; the fourth spine is usually rather shorter than the third, but sometimes equal. These spinelets, though not closely appressed to the side of the ray, stand at an angle to the surface and are directed somewhat upward and outward. Behind the line of marginal spines is a line of small flattened spiniform squamules, larger than the general squamules of the plates; and on the inner part of the ray one or two similar spinelets may be found on the inner portion of the plate; these, however, are wanting on the outer part of the ray, and there are no spinelets on the aboral side of the plate. The surface of the plate is covered with short papillose spinelets rather than squamules, which become longer, more delicate, and very numerous in the furrows.

Ambulacral spines delicate and of moderate length, all cylindrical and only slightly taper, forming three regular series, with three spinelets in each. The inner series radiate well apart, and the middle spinelet is longest. The spinelets of the second series are all equal in length and slightly shorter than the inner series, and are frequently placed in a somewhat oblique line. The outer series are, perhaps, a trifle smaller than the second series, and do not always stand in a regular line; sometimes an additional spinelet is present and sometimes only two.

Ventral plates numerous, 20–30 being present in the interbrachial area, each bearing about 8–10 short delicate spinelets, rather widely spaced and radiating apart, which gives an appearance suggestive of paxillæ, and most of the plates, excepting the inner series, having a longer and more robust spinelet springing from the midst.

Mouth-plates rather short and small, covered with numerous closely-placed spinelets. A double line is present on the surface of the plate, those near the median line of the mouth-angle being largest, robust, compressed transversely, and with tips obtusely rounded, and increase in length towards the inner extremity of the plate. The innermost spines of the mouth-angle form a short horizontal comb of four parallel spines directed towards the centre of the mouth. The margins of the mouth-plates are fringed with a line of about 8 small ciliary spines, which decrease in size and robustness as they recede from the mouth.

The paxillar area is extensive over the disk, and contracts rapidly along the rays, terminating in a point, in conformity with the shape of the starfish. The paxillæ are moderately large, with a broad tabulum bearing in the centre one or occasionally two isolated granules, and surrounded by 8 to 12 short claviform spinelets around the margin which radiate outward slightly. There is a little diminution in the size of the paxillæ towards the centre of the disk, but no trace occurs of any anal prominence or peak whatever. The paxillæ are arranged in very short transverse rows at the sides of the rays, the irregular median space being wide. The paxillæ become very small towards the ends of the rays.

The madreporiform body is small, slightly convex, with fine striations, and is placed at about its own breadth distant from the marginal plates.

The ambulacral sucker-feet are pointed, and the extreme tip appears to be very slightly thickened.

The terminal (ocular) plate is elongate, and armed at the extremity with four or five short robust spinelets directed outwards.

Colour, in alcohol, brownish grey.

Station. Off Inaccessible Island, Tristan d'Acunha. Depth 90 fms.